RUSSIA'S SWEPT-WING BOMBER Page 24

FLYING

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LANDING IN THE SKY

F-85 FIGHTER USES THE WORLD'S HIGHEST AIRFIELD
Page 30

I FELL 2,000 FEET... AND LIVED!

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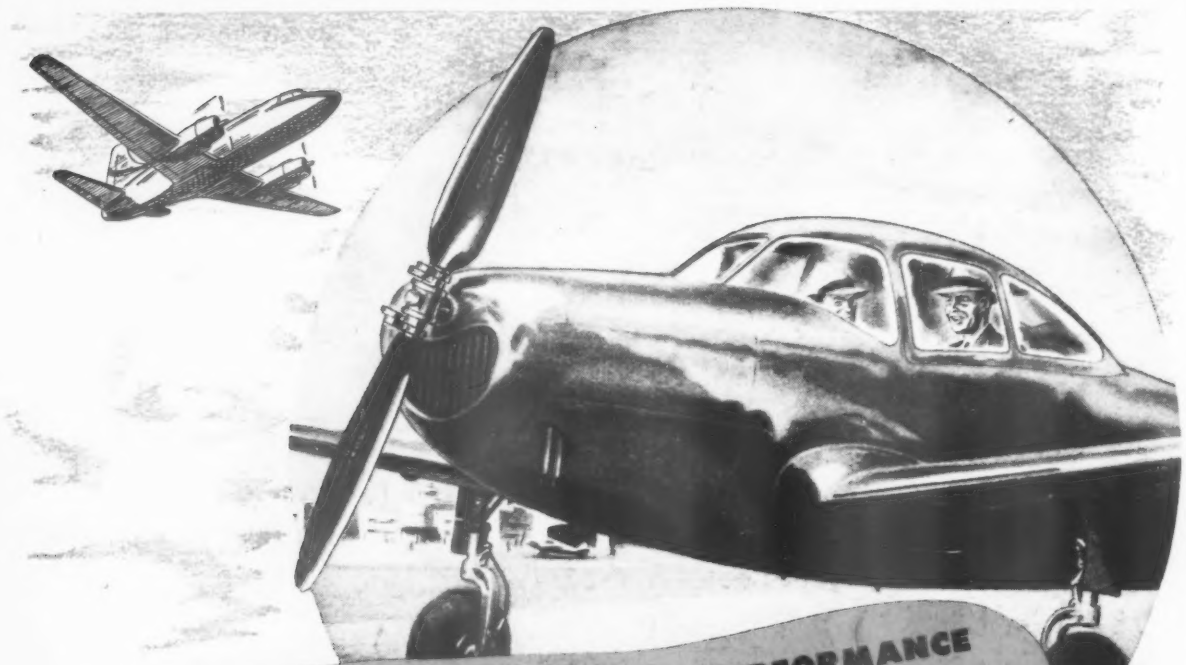

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THE COVER: McDonnell XF-85, jet "parasite" fighter. (See article on page 30.)

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FLYING

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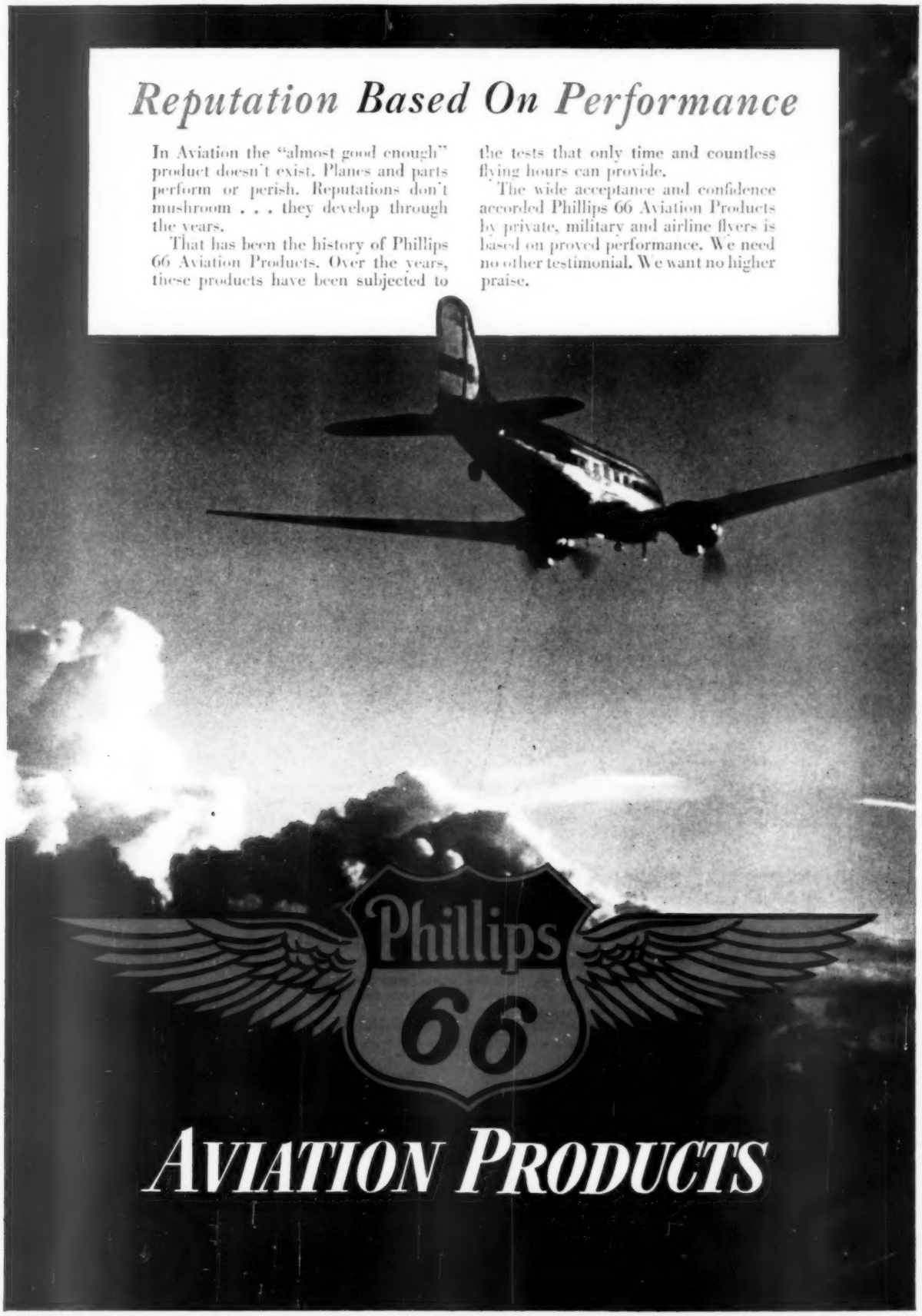
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THE MAIL BOX

THE WRONG GEORGE

On page 19 of the February issue ["What Really Happened at Clark Field?"] you have a picture of Colonel Harold George, but it is the wrong George.

In those days there were two Georges of the Air Forces, Harold L., known as Bombardment George and [the other] Harold, known as Pursuit George. You have . . . displayed the photograph of Bombardment George.

Bombardment George — Pursuit George

At the time of Pearl Harbor, Bombardment George was in command of the Ferry Command, laying the foundation for the Air Transport Command. Take a gander at the lapel insignia—to be sure it is the "Old Second Bombardment Group, Heavy."

Thanks . . . for the series "What Really Happened . . ."—we ex-Air Force people could use more of the same.

JAMES L. KING
MAJOR, AIR RESERVE
Winston-Salem, N. C.

CAP—WHO'S RIGHT?

. . . I was a little fellow in the CAP. I saw the days when the big-dough private pilots flew those "dangerous missions," and got rank, ribbons, and their names in the paper . . . The big-time lawyers, doctors [and] businessmen seemed to head every squadron and group.

. . . I think [the CAP] gives young people a wonderful start in aviation, teaches many good things and is a liberal education. But the glory boys and big-dough boys ought to let others run it on an even scale.

. . . The way things stand now, CAP units are often nothing more than flying clubs.

BEN L. BROWN
Cincinnati, O.

In ["A Report on the Civil Air Patrol," February FLYING] you say . . . that some CAP leaders are "rank happy." I do not believe this is true of CAP officers in general. [In our local unit] the CAP officers give about 300 hours each year for no compensation, no thanks and no recognition from any source . . .

I am a captain in the CAP . . . but certainly feel I deserve my rank. I organized the first unit in this area, have given about 5,000 hours (and all the money I can spare, being a poor man who works for a living) to developing the outfit.

. . . Before the CAP was organized, we had no pilots here, no aircraft, no landing strip. Now we have two airports, more than a dozen private planes and about 200 private pilots.

W. E. HODGES
London, Ky.

[In regard] to the American Legion condemning the CAP as a "waste of money," I'd like to know where and by whom . . .

JOSEPH A. SIMCOCK
American Legion Headquarters
Department of Pennsylvania
Harrisburg, Pa.

• Author Bob Arentz was told at CAP headquarters, Washington, D. C., that the resolution was passed "on or about October 21, 1948, at the American Legion National Convention in Miami, Fla."—ED.

WHO WAS FIRST?

You say Lincoln Beachey was the first man to loop-the-loop ["Who Was First?," February FLYING].

Just to keep the records straight, the first loop was made by the Frenchman Adolphe Pegoud . . . and Beachey did not loop until several months later.

BECKWITH HAVENS
New York, N. Y.

. . . According to [my information] pioneer aviator Delloyd (Dutch) Thompson performed the first loop on March 25, 1914.

FRANCIS E. MIRON
Los Angeles, Calif.

. . . Adolphe Pegoud was the first pilot to loop-the-loop.

R. L. ALLISON
Charles City, Ia.

Pegoud was first.

• Adolphe Pegoud, famous French aviator, *was* the first man to fly a plane upside down (on September 1, 1913.) Beachey, impressed by Pegoud's feat, had a special plane built, and was the first to loop in the U. S.—ED.

(*Continued on page* 78)

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NOTES ON CIVIL FLYING

. . . **Kollsman** has developed a new sensitive altimeter with an altitude counter on the dial. Instead of three pointers, the Kollsman "160" altimeter (below, left) has on its dial a single pointer and a two-digit counter. The pointer makes one revolution per thousand feet and the

counter registers the number of thousands of feet. The altimeter was developed after a study by Dr. Walter F. Grether of the USAF Aero Medical Laboratory showed the large numbers of errors that occur in reading the standard multiple-pointer type (right).

. . . **A new idea** for ground school courses has been started by Aviation Training Enterprises, Chicago. Originally a Link school for airline pilots only, the company has started a radio flying cross country course to familiarize pilots with the proper use of radio aids to navigation. Course includes seven hours of ground school and seven hours of radio navigation practice in a Link Trainer. Price is $65.

. . . **Luscombe** has announced its 1949 *Silvaire Sprayer*, the first production airplane ever factory designed and engineered specifically for aerial crop-spraying. The *Sprayer* is an all-metal tandem monoplane powered by a 90-h.p. Continental engine turning a McCauley Met-L-Prop. It resembles the *Silvaire Observer Special*, from which it was developed. It has oversize tires to permit cross-furrow landings, a Safe Flight Stall Warning Indicator, and a chest harness as standard equipment. It comes complete with spray equipment. The *Silvaire Sprayer* will take off in 500 feet and land in 400 feet under no-wind conditions. It cruises 105 m.p.h., with spraying range 50 to 90 m.p.h. Stalling speed with full flaps and power on is only 40 m.p.h. The *Sprayer* carries more than 50 gallons of spray solution at its recommended spraying weight of 1,500 pounds. Price is $3,595 f.a.f. Dallas.

. . . **Douglas** plans to produce a "Super DC-3" which will be faster and will carry more passengers than previous models. The Super DC-3 will carry 26 or 28 passengers instead of 21, will be more rugged structurally, have a new high-speed square-tipped wing, an enclosed landing gear and a retractable tail wheel. Douglas will not produce the planes new but will modify existing aircraft to meet the new specifications. The Super DC-3 will cruise at 234 m.p.h., an increase of 45 m.p.h., and will use either Wright *Cyclones* or P&W R-2,000s.

. . . **Beech Aircraft** has released results of a study of all accidents with *Bonanzas*. The study shows that only 1.4 per cent of all A-35s in use have been involved in accidents—or an estimated total of 1,352,853 airplane miles per accident. The estimated cost of each accident was $5,102.66. The approximate average cost of accidents thus was $\frac{3}{8}$ cents per airplane mile or $\frac{1}{10}$ cent per seat mile. "The statistics indicate that modern corporation and private owner airplanes are good insurance risks," Beech points out.

. . . **Temco** has successfully completed initial test flights on its new military-type trainer to be offered to the U.S. Air Force. The Temco TE-1A (shown below) is a two-place tandem primary trainer, which can be produced and delivered for less than $12,000. Approximately 80 per cent of the *Swift's* engineering and tooling can be used on the TE-1A. The craft has a 145-h.p. Continental engine, top speed of 160 m.p.h., range of 435 miles, maximum diving speed of 210 m.p.h., and sliding Plexiglas canopy. It will cruise at 150 m.p.h. have a rate of climb of 925 f.p.m.

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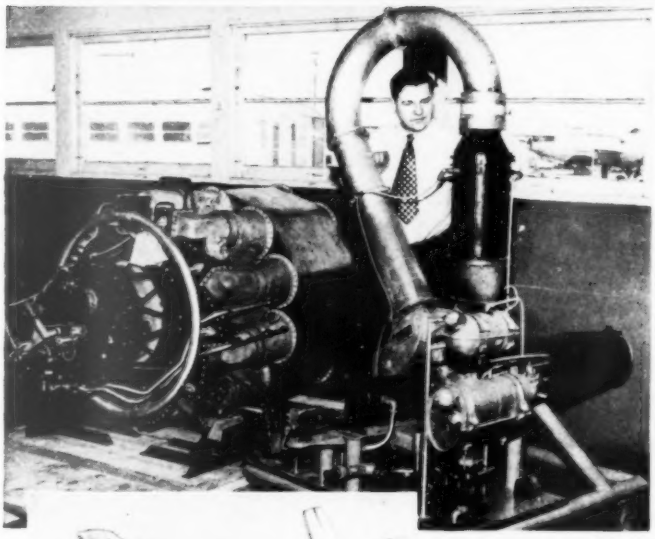

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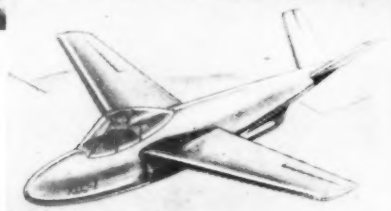

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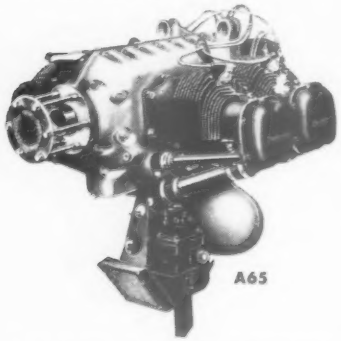

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MILITARY NEWS

. . . **Newest Thunderjet** is Republic F-84E, a fighter with improved structural and maintenance qualities. Approximately 500 *Thunderjets* have been built and about the same number are yet to be completed on present contracts. Though exact figures are still under cloaks, performance of the F-84D and F-84E is "slightly better" than that of previous F-84 models.

. . . **One hundred C-46s** will be reconditioned by Curtiss-Wright for the Air Reserves. The twin-engined transport planes have been stored at Walnut Ridge, Ark.

. . . **Berlin Airlift Clasp**, a newly-authorized military award, will be worn on the ribbon bar of the Occupation Medal for Germany. All personnel connected with the Airlift for three months or longer are authorized to wear the clasp, a miniature gold-colored replica of a C-54.

. . . **Small atomic powerplants** may be in operation within three or four years, but at least 20 years (and probably longer) will be required before large amounts of atomic power are generated, predicts Richard G. Lorraine of General Electric.

. . . **Largest bomb load** ever carried aloft (84,000 pounds) was dropped from a B-36 recently at Muroc, Calif. The giant Convair, which weighed more than 300,000 pounds at take-off, carried two 42,000-pound "grand slam" bombs.

. . . **Consolidation** of Air Force Reserve and the Air National Guard will be studied in Washington, D. C., by a board of high-ranking officers, headed by Lieut. Gen. Elwood R. Quesada, new Reserve commander. The group will meet as a preliminary to drafting legislation for unifying the two civilian air arms.

. . . **Over 40,000 air Reservists** will receive pay for inactive duty training with the Continental Air Command and its six Air Forces. For the first three months of 1949, $1,681,000 will go to Reservists.

. . . **Jet helmet**, the P-1, designed at Wright Field, weighs only two pounds but will absorb 64 foot-pounds of energy without rupture. It offers more protection than any other protective helmet now available. Originally designed for research pilots, it is now used in all types of jet-propelled planes.

. . . **Planes still on drawing boards** may be "test hopped" in the future before they are built. Admiral Luis de Florez, wartime chief of Naval training devices, recently revealed a project that, if successful, will enable designers to obtain accurate preconstruction knowledge of any plane's flight characteristics. He proposes to feed design statistics into the hopper of an electronic computer which comes up with aerodynamic answers. These answers can be built into a "synthetic plane" which will simulate flight characteristics of the design.

. . . **New Assistant Secretary** of Navy for Air is Dan A. Kimball, who succeeds John Nicholas Brown. Kimball is executive vice-president of Aerojet Engineering Corporation, and vice-president and director of General Tire and Rubber Company.

. . . **Air Force uniforms** below (to be worn after September, 1950) will be slate blue, identical for officers and enlisted men except for insignia of rank.

Aviation cadets will return to blue uniforms similar to those worn before World War II, when the next class begins on April 4.

. . . **Two unofficial speed marks** were set recently on trans-continental flights by new Air Force jets. A Boeing *Stratojet* (B-47) flew 2,289 miles from Moses Lake, Wash., to Andrews AF Base, Md., in 3 hr. 46 min. at an average speed of 607 m.p.h. The next day, the much larger Northrop Flying Wing (B-49) flew 2,258 miles from Muroc, Calif., to Andrews Field in 4 hr. 29 min.—at an average speed of 502 m.p.h.

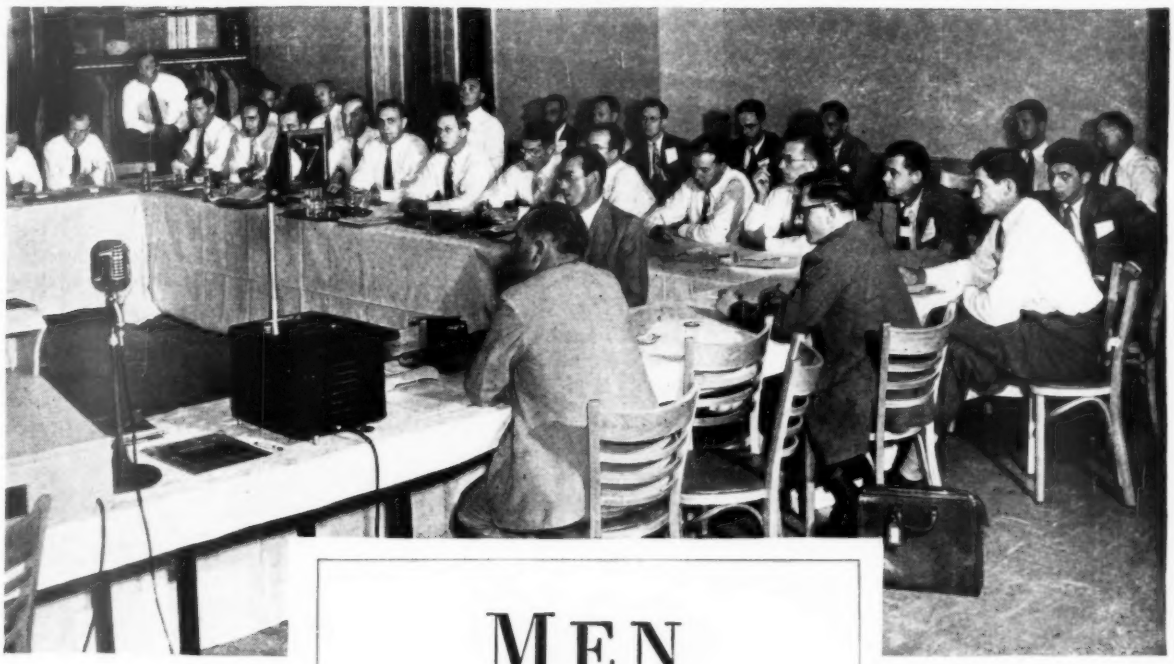

Photo taken at Champion 4th Annual Aircraft Ignition Clinic

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in shirt sleeves

For the past four years, it has been the privilege of the Champion Spark Plug to play host, annually, to a group of aircraft maintenance and service engineers from the armed services, leading air lines, and engine manufacturers. This annual three-day Aircraft Ignition Clinic is truly a "shirt sleeves" session which has been highly productive of constructive information and procedure for both our guests and ourselves.

This union of research, engineering and manufacturing experience, with equally broad experience in ignition problems as they occur in operation and maintenance, has been of great benefit to our own research and engineering, and has, from the expressions of our guests, been of equally great value to them.

Out of it, we believe, come better, more dependable Champion Spark Plugs for every aircraft engine, and every operating and maintenance condition.

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Actual Size
Shielded Type

C26—
Unshielded
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FOLLOW THE EXPERTS

USE CHAMPIONS AND FLY WITH CONFIDENCE

AIRLIFT

National security depends largely upon the full use of air power in all its phases. One vital operation is airlift—dramatically pointed up by the air supply of Berlin and more recently by food-rescue missions in the snowbound areas of the West.

Fairchild has developed and produced cargo and troop transports designed for airlift. The C-119 *Packet*, soon to succeed the C-82 *Packet*, will further demonstrate the ability of the aircraft industry to meet the requirements of modern airlift tactics.

An airborne signal team loads jeep and trailer carrying field radio equipment into the cargo hold of a Fairchild *Packet*. Delivered to a forward air strip by experienced Air Force pilots, this unit will provide essential mobile signal service at an advanced base.

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"props" are tops for training

The big multi-blade propeller could mark this as a scene in an airline overhaul base. The men might be certificated A & E mechanics. Actually, as Mechanics course students at Northrop Aeronautical Institute, they are putting the finishing touches to a propeller overhaul job, under an instructor's guidance.

The giant propeller is a typical example of the practical equipment on which Northrop students get *first-hand, practical* experience. At Northrop, "props" are tops for training ...as are all the many modern tools, machines, accessories, power plants, and "live" airplanes in the Institute's extensive Aircraft and Engine Mechanics training division.

Everything about the Northrop training program contributes to making the graduate's first position as a certificated A & E mechanic virtually a continuation of his student experience at Northrop.

Such training pays off. Northrop A & E graduates with airlines have won supervisory posts, are inspectors and special technicians, have been chosen as flight engineers. Other graduates are making good on their own as private repair station owners.

Northrop graduates and students know there is a big future in Aviation Maintenance. YOU, too, can prepare for it—in only 50 weeks—by getting the CAA-approved, Northrop training. Send the coupon for full details.

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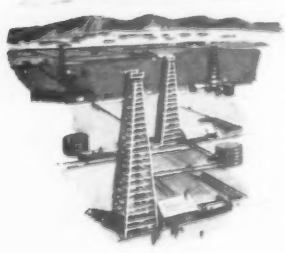
Key men of Weatherford Oil Tool Company, Texas, really get around with their *seven*-plane fleet of 4-place Bonanzas. Weatherford makes oil well tools and equipment, has 38 distribution centers in ten states. The sales situation, as in many another business, calls for fast action. They get it—by Bonanza!



"Now we can increase our sales calls by 40% over those we could make by fastest public transportation," says President J. E. Hall, Jr. "If we hear of a potential sale in another state, we have a man there in hours. And customers like fast action when waiting for equipment. Oil rig time is expensive. Now our men, with equipment, get there pronto by Bonanza."

Sales Manager John Hall even uses his Bonanza as "reconnaissance"; spots well locations from the air, follows up with sales calls. Because Bonanzas are *quiet* and comfortable, they're ideal as customer transports. Cost of operation? About the same gas and oil consumption per mile as an auto! This Bonanza fleet is a profitable, *paying* proposition.

Travel on business? Investigate Bonanza Travel

Apply this revolutionary business "machine" to *your* business. It means you slice travel-time by two-thirds . . . a saving you put to *profitable* use. Investigate. A note on your company letterhead brings an informative 60-page brochure on "The Air Fleet of American Business." Write today to Beech Aircraft Corporation, Wichita, Kansas, U. S. A.

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FLYING
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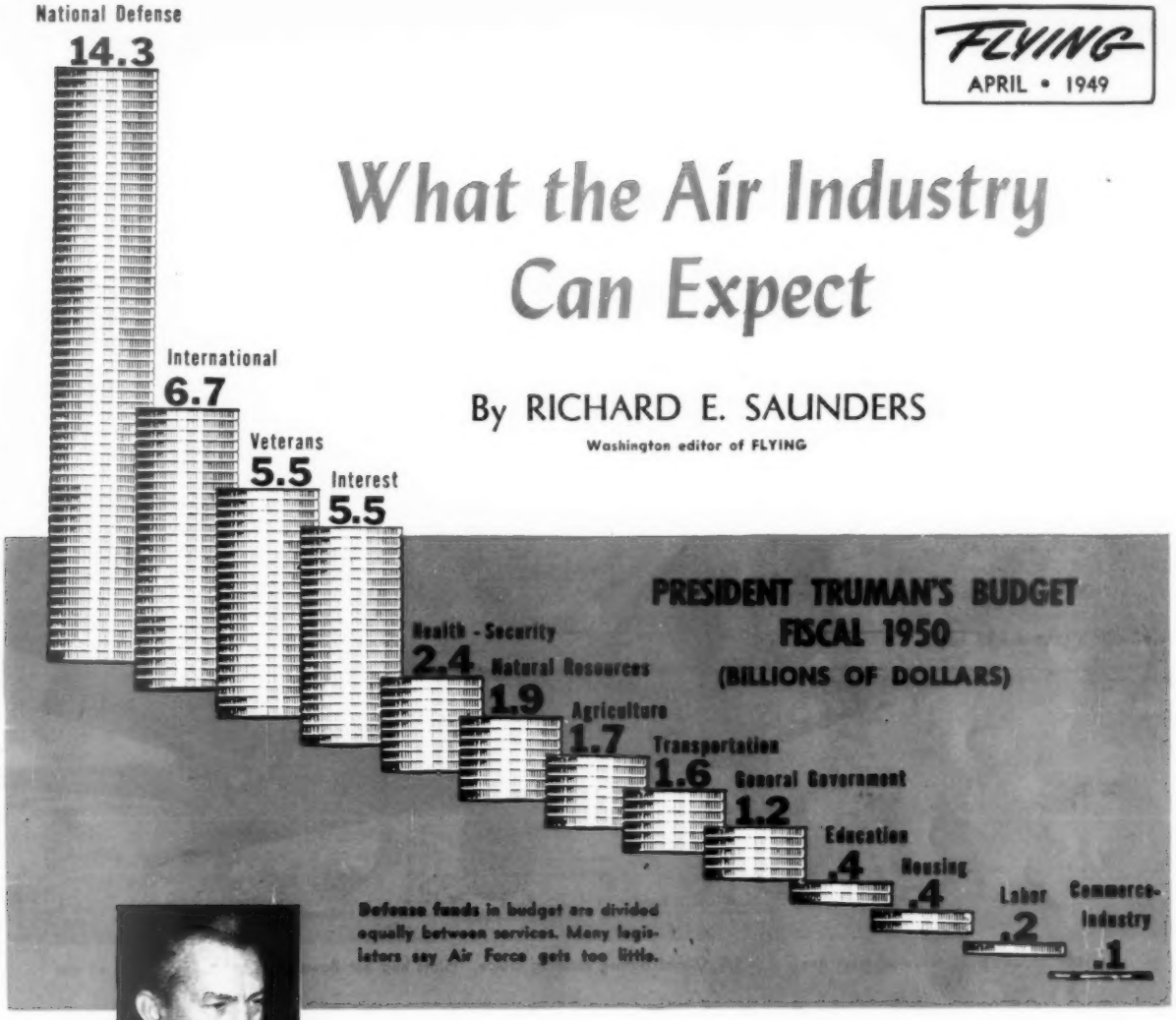
What the Air Industry Can Expect

By RICHARD E. SAUNDERS

Washington editor of FLYING



Leading figures in controversy over Air Force funds are Secretary of Defense Forrestal (top) who wants equal appropriations for all services, and Congressman Vinson (Ga.) who demands more for plane procurement.

Congressional leaders are swinging toward a 'big Air Force' philosophy.

THE big defense decision facing Congress this session is whether to wait five years before making the Air Force the dominant factor in U. S. defense. James Forrestal, head of the National Military Establishment, says that airpower will be tops in defense strategy in about five years—but that the U. S. is not yet ready to scrap its equally-balanced three-pronged defense setup.

First, Forrestal insists, we must have planes that can bomb strategic objectives half-way around the world, from U. S. bases. We're procuring these bombers now; others, with even better performance, are on the drawing boards.

But Congress, while agreeing that we shouldn't abandon our other weapons for a while, is inclined to hasten the day when airpower will come into its own. Capitol Hill has shifted its thinking on National Defense. Former "big Navy" supporters are swinging over to the "big Air Force" philosophy. Among the converts is Chairman of the House Armed Services Committee Carl Vinson of Georgia—who before Congress streamlined its committee organization was Democratic head of the House Naval Affairs Committee.

Unless the present trend is unexpectedly (*Continued on page* 77)

Group 71 Goes Back to Sea

Hellcat of CVEG-71 takes off from deck of U.S.S. Cabot during training cruise. Pilots had not flown from carrier since end of war.

By CURTIS FULLER

Managing Editor of FLYING

Glenview group on carrier cruise serves as yardstick to measure combat-readiness of Naval Reserve's air strength.

THE morning had been hazy, with a low overcast. Intermittent rain spattered rows of planes on deck. The U.S.S. *Cabot*—fast *Independence* class carrier—steamed south in the Gulf of Mexico to outrun the weather.

By early afternoon, ceilings and haze had lifted. The order came: "Pilots, man your planes."

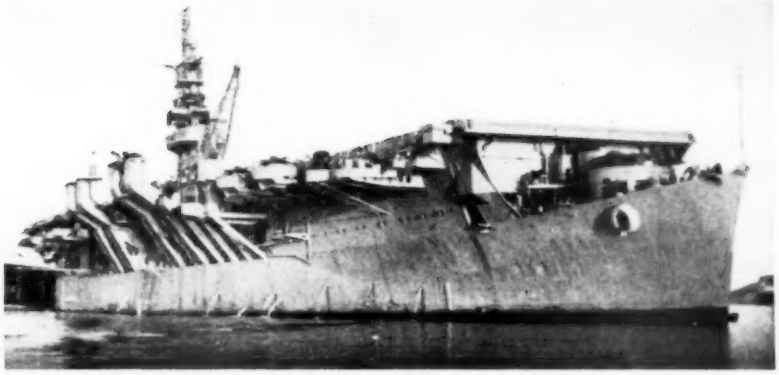
And on the deck a unit of engineers, salesmen, investment bankers, students, factory workers, electricians, mechanics, potters, insurance brokers got ready for its first peacetime carrier take-off. The Reserve pilots of CVEG (Escort Carrier Group) 71, stationed at Glenview, Ill., had waited 2½ years to get back aboard a carrier. Former World War II pilots, many with Jap planes to their credit, they were at sea for the first time since VJ-day.

Not since Japan's surrender had a Naval Reserve air group operated as a unit aboard a carrier, though a Dallas group had flown a series of check-out flights aboard the U.S.S. *Wright*. CVEG-71 was a guinea pig outfit; it was being tested to determine the combat readiness of the Navy's Air Reserve components. The cruise was a test for all the Weekend Warriors.

That's why Rear Adm. Richard F. Whitehead stood on the bridge, watching each movement of the men and planes. The admiral, in command of all Naval Air Reserve training, knew that this group's performance would give an indication of the status of the Navy's other 55 Reserve air groups, of the 27 patrol and 25 transport squadrons and the 48 service squadrons which are his responsibility.

The pilots filed from the ready room, mounted to the deck and clambered into their craft. The *Avengers* were forward, waiting to be catapulted first. At 1322, Lieut. Comdr. Norman A. Carlson, commander of the attack squadron and a salesman in private life, started the engine of his *Avenger*. In a few minutes virtually all the

Rear Adm. Richard F. Whitehead and Capt. John W. King watch Reserve air maneuvers.



U.S.S. Cabot is a CVL (light) carrier of the Independence class. Craft fought all through the air war in the Pacific and was fresh out of mothball fleet when CVEG-71 came aboard.

propellers on deck were turning. Ten minutes later, Carlson killed his engine, folded his wings and sat next to the catapult that was to have sent him off. He was having difficulty with his engine.

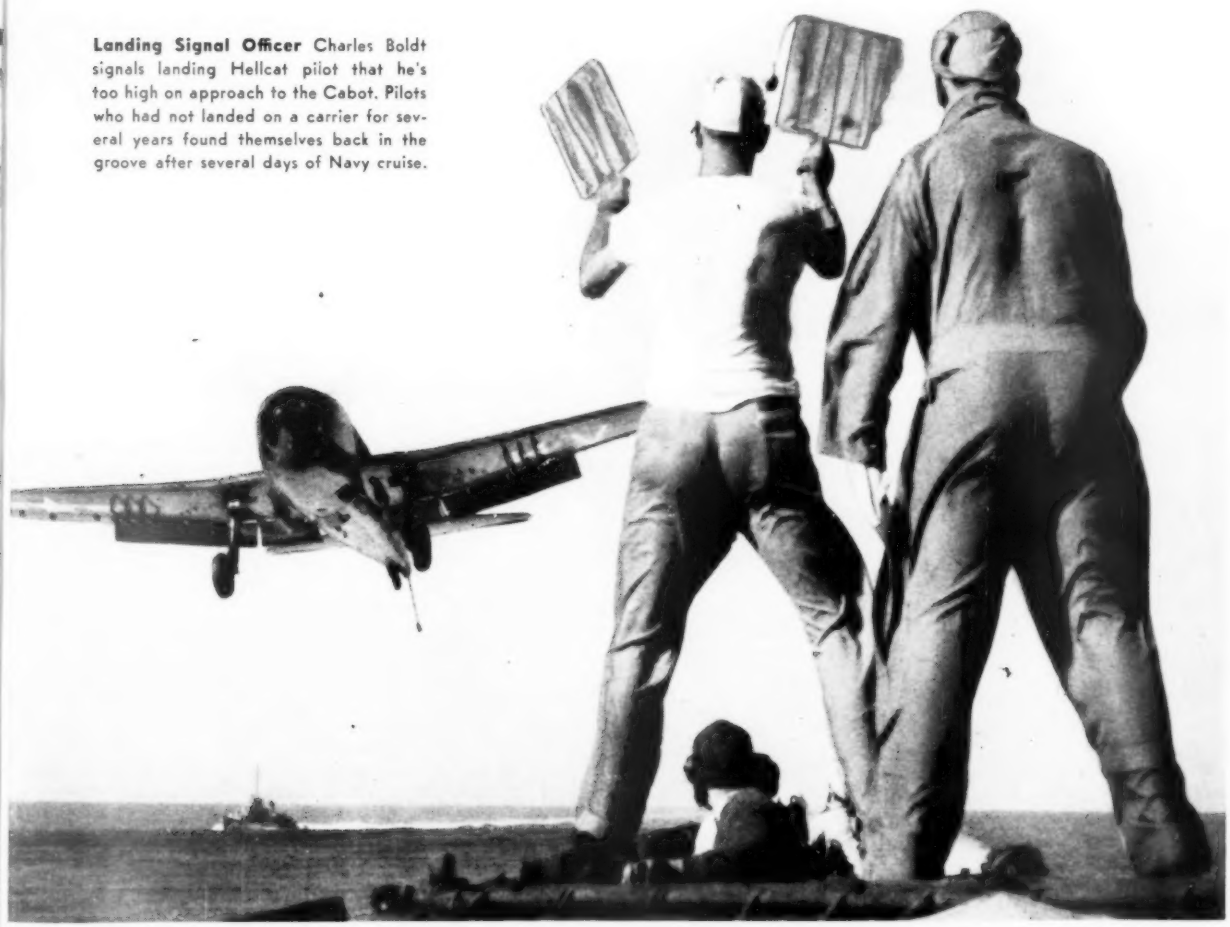
Meanwhile the other pilots stayed with their aircraft mulling over their briefing.

Capt. John W. King, commander of the carrier, had told them:

"We're not starting out here to break any records. We're here to take it easy. The flight deck is probably narrower than you've been used to. We have a fairly green crew and so have you. We don't want anyone to get hurt."

At briefing, ship and air group officers examined details with painstaking attention. "For TBM's, flaps will be set full down. Elevator tab should be approximately 1½°

Landing Signal Officer Charles Boldt signals landing Hellcat pilot that he's too high on approach to the Cabot. Pilots who had not landed on a carrier for several years found themselves back in the groove after several days of Navy cruise.



During briefing in ready room of Cabot, weekend warriors recaptured briefly the atmosphere of World War II days. They are briefed on missions, and mistakes are analyzed here.

Green crews proved eager in shunting the planes about deck. Many of the enlisted men had never been on a carrier before.

Crashed Hellcat engaged arresting gear too far to starboard and smashed into stack and deck gear. Pilot was not injured.

nose down. Set rudder tab approximately 3° right rudder, and set the aileron tab 1° left wing down.

"On launching we'll give you at least 300 feet. That's 80 feet more than you need. We'll give you 40 per cent more deck than you actually need. We're going to have from 32 to 35 knots of wind over the deck. That's quite a bit. Remember it when you start your turn."

Landing Officer Charles Boldt (who was borrowed from the Pensacola Air Station) explained: "You're used to landing on fields. This deck is 60 feet higher than a field. So make your approaches at 160 feet instead of 100. If you find you float, go around for another landing. Don't dive at the deck.

"I'm a little fanatic on early cuts." Lieut. (jg) Boldt, who has waved 8,000 planes to landings, said. "Try to hold your speed down. But if you're a little fast I'm going to cut you a little early. Don't worry. You'll make it."

The delay in getting the first planes off the carrier stretched into minutes. The 33 pilots, 16 deck officers and 152 enlisted men of Group 71 had ample time to recall their instructions.

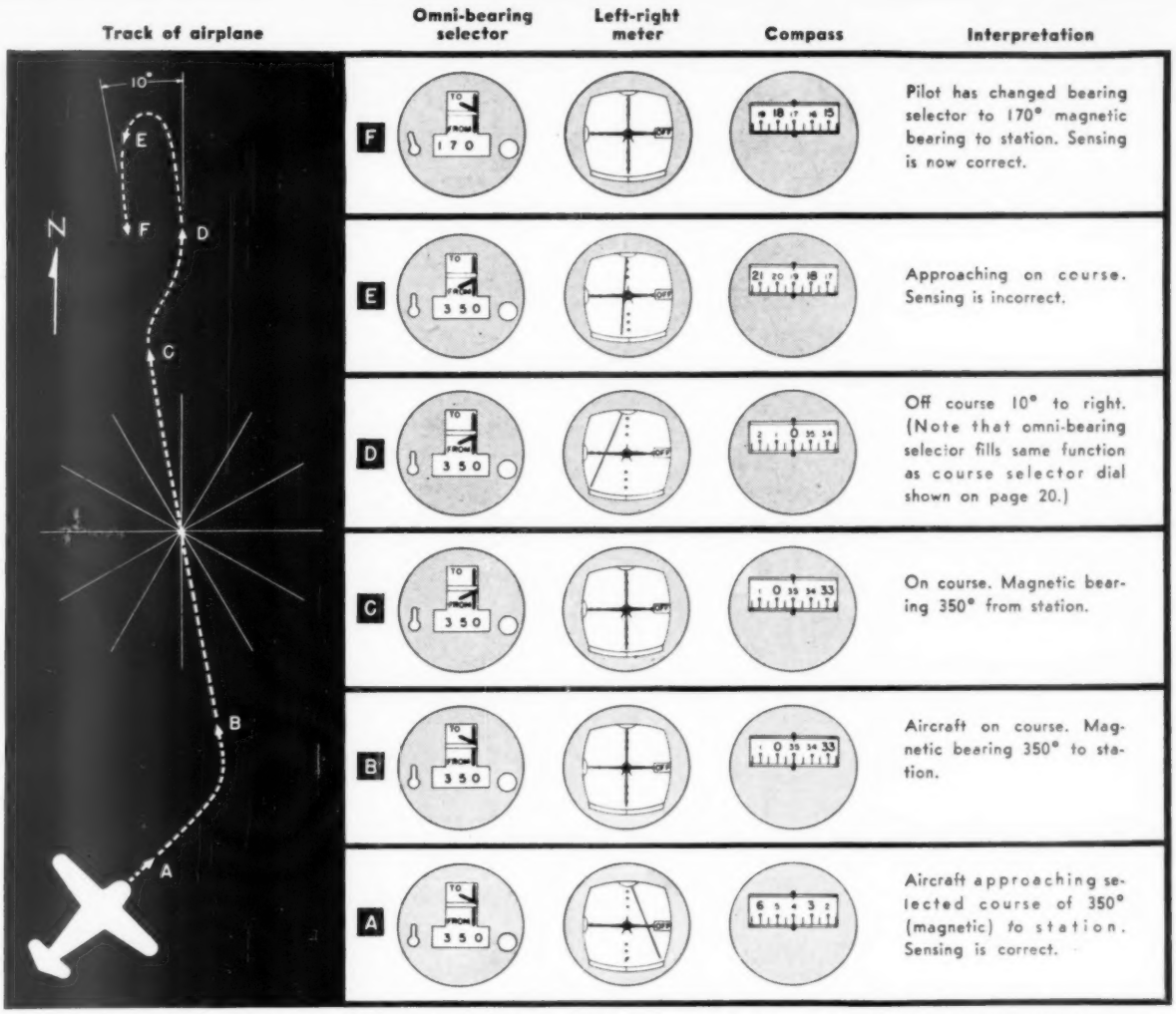
After a second false start, when Carlson again encountered engine difficulty, the *Avengers* forward were ordered down on the hangar deck to make room for the planes aft. The flight operations flags were hoisted again, and the other planes were set for take-off. Lieut. (jg) R. G. Clinnin of Oak Park, Ill., flying one of the remaining *Avengers*, was first off at exactly 1400.

CVEG-71 consists of one squadron of 24 *Hellcat* fighters and one squadron of 14 *Avenger* (TBM) torpedo bombers. The *Cabot* is larger than the *Casa-Blanca* Class (CVE) carriers for which the CVE groups are organized. However, only 20 *Hellcats* and eight *Avengers* of the group came aboard at Pensacola.

Of these planes, 19 were airborne within 35 minutes after the first take-off. Most of the hands were green and had never worked together on a carrier, and two of the *Hellcats* pulled up lame before they could be flown off. They had to be pushed aside to clear the decks. Considering those detrimental factors, the performance was good.

Three minutes after the last *Hellcat* was airborne, the loud speaker blared out, "Stand by to receive aircraft." This was the pay-off. Could men who hadn't landed on a carrier in three or four years do it as a matter of course? Before the cruise, several pilots had claimed that it was easier to land on a carrier than on a dummy outline painted on a runway in some inland town. "You can always land into the wind, and in addition you have the carrier's speed," they said.

It didn't work out exactly that way. *Hellcat* V-22 piloted by Group Commander Richard K. West of Evanston, Ill., vice-president of an instrument manufacturing company, made the first landing—and a good one too. Several other planes made excellent landings. Then Lieut. (jg) R. G. Lippold of Woodstock, Ill., a screw machine operator in private life, took the LSO's cut a bit late and drifted off to starboard. Lippold's *Hellcat* engaged the arresting gear too far to starboard and the plane, caught by its tail hook, nevertheless came smashing into a small tractor, the deck crane, and other equipment on the starboard side of the deck. He (*Continued on page* 75)



Omni-range instruments will read like this during flight projected by plane at left. Interpretation of dials is in right-hand column. Read the chart from bottom to top, following the flight of the plane. Explanations are keyed to flight diagram by letter symbols.

How to Fly the OMNI

By HARLAND WILSON

Simplified navigation system is ready for private pilots.

NOW that the CAA has already installed more than 300 omni-ranges in the United States, and several VHF receivers with omni-range navigation systems within reach of the private pilot are on or about to reach the market, it is high time that pilots who haven't yet seen them be told how they work. So far, published material on the omni-ranges has mostly dealt with theory. But omni is no longer theoretical. It's practical, it works. It is amazingly simple and, best of all, it's here.

If you've relied on the published omni-range theory for most of your information about omni, you're due for a pleasant surprise when you actually use the equipment. For here is a navigation system simpler than you ever dreamed of. When you first fly an airplane equipped with an omni-range navigation system you'll find it difficult to understand why it may have seemed complicated.

Let's assume that your plane is equipped with the Narco omni-range equipment which has been developed under contract with the CAA, and will shortly reach the market. It is one of two omni-range systems for light aircraft which are now in production, the other being the Lear Omnimatic system to be described later. The Narco outfit weighs about 15 pounds and costs around $450. Here's what the equipment consists of:

First you have the VRA-1 Narco VHF radio receiver. Well, you need a radio receiver anyway, and this provides you reception in the static-free VHF channels between 108 and 122 megacycles. These channels include localizers, range signals, omni-ranges, airways communications, approach control and towers. You'll also have a transmitter, of course, for the Narco outfit is two-way, and you'll have a power supply unit which is mounted remotely.

All this is only standard radio equipment and hasn't in-

Narco VHF transmitter, receiver, and omni-range equipment was developed under CAA contract. Omni-range equipment includes the course selector dial (top, left), the to-from meter, and the left-right meter (bottom, center). These gadgets simplify navigation.

cluded any of the navigational features that will make omni such a boon to pilots. So here is additional equipment which is used with the radio receiver to help you navigate. Memorize these names because you will hear a lot more about them in the course of your future flying. They are (1) a course selector dial or omni-bearing selector dial—whichever you choose to call it, (2) a left-right meter, and (3) a to-from meter. These are the new instruments which will simplify your cross-country flying immeasurably.

Let's take off from Weir-Cook airport at Indianapolis with our Narco-equipped lightplane and demonstrate how these new gadgets work. We desire to fly to Lafayette, some 60 miles away on a course of 325°. We have to determine the magnetic bearing to Lafayette omni, but that is the only reason we need to consult our charts—though of course a good navigator always likes to keep them handy for a double check.

We take off, tune our VHF receiver to Lafayette omni-range, which is 113.5 megacycles, and simply fly there.

"But how," you ask, "how do you fly there? Don't you need a chart for checking your course? Don't you have to make any wind corrections? Don't you have to draw your course line on a map and make a lot of other fancy computations?"

No, you don't.

You simply tune your set to Lafayette omni, set your course selector dial to 325°, and fly. Your left-right meter will show you whether you are flying to right or to left of your course. If the needle shows to the right, you turn to the right. If it shows to the left, you turn left. Just keep the needle centered or "zeroed" and you will fly directly over the omni-range station at Lafayette when you've flown far enough.

"Simple enough," you say, "but suppose you are flying to a place that doesn't have an omni-range. Then what do you tune to?"

That's easy, too. You tune your receiver to the station you are flying *from*. Take off from Indianapolis and fly, say, to Elwood, Ind. Tune in to Indianapolis omni, 114.1 megacycles. If you have any doubt about that, a recorded voice repeats at frequent intervals, "Indianapolis omni-range," "Indianapolis omni-range."

Find out the compass bearing to Elwood, which is 30°. Set your course selector dial to 30° and keep your needle centered. There's only one difference between flying from an omni-range station and to a station. In the one case your to-from meter will read "from" and in the other case "to."

That's all there is to it. You can fly on any heading from any omni-range station simply by tuning in on the station, setting your course selector dial, and keeping your left-right needle centered. You can fly to any omni-range station by the same method. There is no difference in the navigational technique; the only difference will be that your to-from meter will indicate whether you are going to the station or from it.

The omni will always keep you accurately on course.

You don't have to worry about compass corrections, variation or deviation. No matter what your drift is, your compensating crab will be absolutely automatic because the omni is position sensitive, not heading sensitive.

There's only one complication in all this. Your omni-range navigating equipment is more difficult to use when you are not flying to or from a destination equipped with omni. Under these conditions it is necessary to take a series of fixes on two omni stations. Each fix may be taken by reading the bearing to each station in quick succession. Two or more fixes plotted on the map establish the track which the aircraft is making good. By making a few corrections in heading it is possible to make the desired track good and arrive at the destination.

The DME (Distance Measuring Equipment) now under development for use with omni will simplify this procedure since only one omni station must be tuned in and the information will be available continuously. DME isn't available yet, however, and when it is it is likely to prove too costly and too heavy for private flying for many years. With combined omni and DME stations, and a computer in your plane, it will be possible to establish a course between any two points.

Omni is a valuable navigation aid and will be even more valuable when all the 470 omni-range stations are installed in the United States. They already total more than 300 and comparatively few places in the country are not now within range of omni.

This isn't all you can accomplish with your omni-range navigational devices by any means. You can find yourself if you're lost, for instance. Simply tune your receiver to a known station and work your heading and course-selector dial until your right-left needle centers. That will give you azimuth for that station. Draw a line on your chart along that azimuth line. Do the same for another station and where the two lines cross—that's where you are.

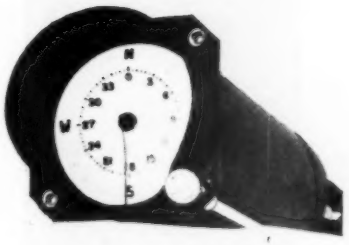
You can fly to any omni station within range without reference to a chart, though it may take some hunting. Simply tune to the station, turn the airplane and work your bearing selector dial until the left-right needle indicator centers. You can tell by its indication which direction you should turn. When you have the needle centered, fly the needle. It doesn't matter if the omni station you are flying to isn't located right on the airport. Fly to the station, then set your course selector to the proper heading *from* the station.

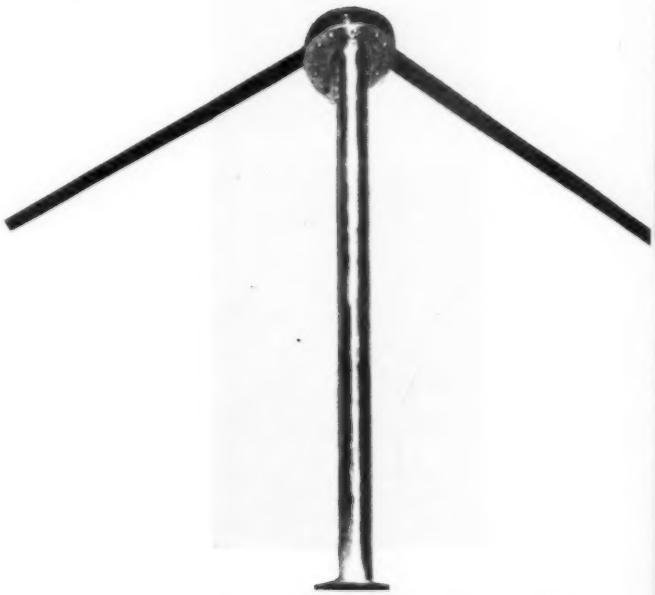
Omni-range receivers are designed so that when the Instrument Landing System (ILS) localizer beams are converted to the new phase localizer type, the right-left needle may also be used for an instrument approach on the ILS localizer beam. More expensive omni sets also have glide-path needle indications.

With omni, pilots can fly inbound or outbound with a degree of accuracy and simplicity hitherto unknown.

The Narco system works essentially like larger and more expensive systems such as the Collins, Bendix and Federal, but an unusual navigation set based on a different sort of system is the new Lear Omnimatic system. Instead of rotating a course selector, flying a left-right indicator, and checking a to-from meter, on the Omnimatic system you simply tune the Lear VHF receiver and read a visual direction-finding indicator called the "Omniscope." The Omniscope is the face or screen of a three-inch cathode ray oscilloscope tube.

The screen is calibrated in degrees of azimuth exactly as a magnetic compass scale. When an omni-range station is tuned in, a circular pattern appears on the screen with a "pip" at some point on its circumference. This pip gives the magnetic bearing of the omni-range station to which it is tuned. It tells the (*Continued on page* 73)





Lear Omnimatic system includes transmitter-receiver, top, "omniscope", middle, and V antenna. Omniscope has a cathode ray tube calibrated as a compass scale. A pip on its screen gives bearing to omni station.

I Fell 2000 Feet

'I Pulled the Ripcord—but Nothing Happened!'

"I OPENED the door of the Piper *Supercruiser* at 3,100 feet, and stepped out into space. Below, 2,000 customers at an upstate New York airshow waited to see my 'death-defying double-jump.' In it, I float 400 or 500 feet with my first 'chute, unharness, hurtle about 500 more feet with nothing but a weak smile for an umbrella, then put on the brakes with a second 'chute.

"The first 'chute opened easily, and I waved at the crowd from my pitching perch high above them in a stiff 45 m.p.h. wind.

"Then I unbuckled all but one of my harness' snap fasteners, hauled hard on my 'chute suspension lines to force out enough air to collapse it. It was just a streaming, screaming scarf behind me when at about 2,000 feet I pulled the ripcord of 'chute number two. Nothing happened!

"Supposedly, when you're face-to-face with death your whole life flashes before you. All I recalled was my basic training at paratroopers' jump school. I searched, clutched for some trick, some thought that would help. I had to open that parachute!

"All the way, with the ripcord obviously and horribly fouled and immovable, I fought it—tugging from every possible angle. The wind knifed at my nostrils. The ground hurtled toward me. Feet first, I plummeted toward swampland 1,000 feet south of the field. Behind me, the streamer of 'chute number one cut through the 45 m.p.h. wind. The interlocking branches of scrub trees rose up to slash me. I did the only thing I could remember from my training—rolled into a ball . . .

"They tell me airport crewmen and spectators took off on a dead run for the spot where I'd plunged out of sight—but that no man wanted to be the one to find my shattered remains. Then they heard me groan. That amazed them. Not one of them had expected to find more than just pieces.

"My right arm had smacked first. It had driven into the ground like a stake—up past the elbow. Mud and blood spattered my cheek. My left leg lay twisted and limp. 'My chest,' I moaned. 'My chest!' The crowd felt sure I would have been better off dead.

"They were wrong.

"Falling from a height almost twice that of the Empire State Building's 1,250 feet, I had suffered no internal injuries. My right arm, left leg and five ribs were fractured. My face was gashed. But I'd be up and around again in two months . . .

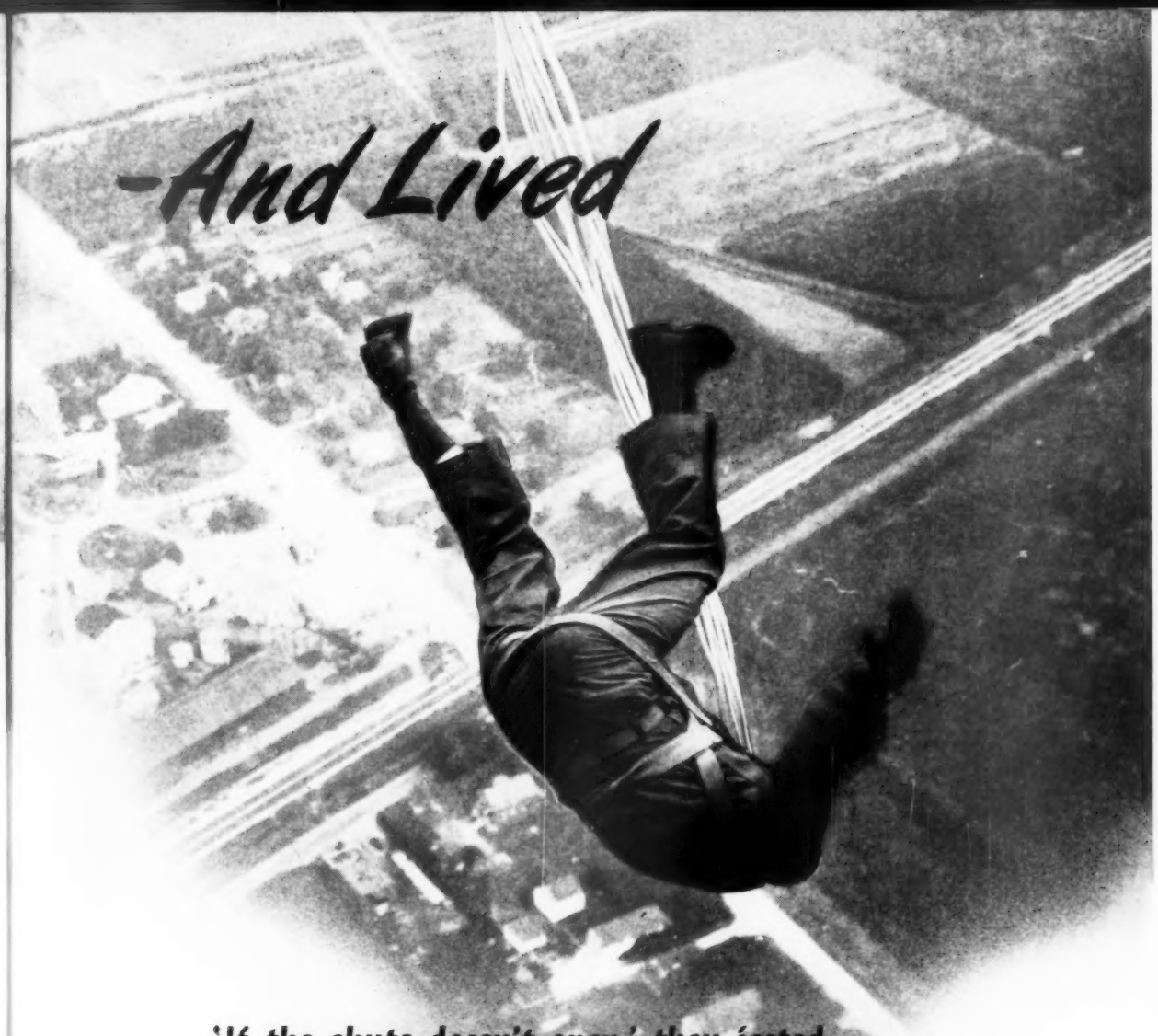
"If that 45 m.p.h. wind hadn't been blowing, I wouldn't have jumped from the plane so far to windward of the field. Instead of landing in 'comparatively' soft swampland, I'd have fallen to death on the treeless, mudless field itself. There were other 'if's' . . .

"I missed impalement on a tree stump by a slim six inches. Sideswiping a branch broke my left leg—but it broke my fall, too. It broke it just enough so that when I smacked unconscious into the muck, shock or internal injuries or a fractured spine or any of a score of other injuries didn't kill me right off.

"When I opened my eyes, I saw a priest kneeling over me, administering the Last Rites. That's quite a feeling. I found out later that he was Father Wilkins of Woodbourne Prison. I'm a Presbyterian, but he'd been told I was Catholic. Turned out it was pretty fitting anyway. He was the prison chaplain. I'd escaped death."

—CHARLES (GABBY) GARBUTT

Gabby Garbutt lay unconscious, apparently near death, when spectators found him after 'chute didn't open (inset). Next day, he laughed and joked with photographers and nurse in hospital room. Despite the experience, Gabby plans to continue working as stunt parachutist.



-And Lived

'If the chute doesn't open,' they jested, 'bring it back for a new one.' Gabby Garbutt did!

By HOWARD EISENBERG

A 100-FOOT HIGH bridge spans the Monongahela River at the small town of Charleroi, Pa. One day in the early 1930s a boy clambered up on the railing of the bridge, poised a second, and dove into the swirling water.

Young Charles (Gabby) Garbutt saw the feat. But unlike the dozen other teen-agers who gasped excitedly, he considered it a direct challenge.

Within 15 minutes, he had lugged an egg-crate up on the bridge, balanced it precariously on the railing, climbed aboard and—two feet higher than his predecessor—rocketed off.

That is typical of Gabby's personality. He wants to jump farther, from higher places, with more handicaps than *anyone* else. His fascination of the "high-way" later led him into the paratroops in World War II—where he was wounded in action. It enticed him into the professional role of "stunt-parachutist" with a total of 184 jumps to his credit. And it brought him face-to-face with death in the unbelievable 2,000 foot free-fall described on the facing page.

While there's unanimity on how lucky Gabby was, there can never be unanimity on exactly how far he fell last August. Gabby's pilot, Dee Lord, had his altimeter set at another airport, but in relation to the Monticello Field his 2,000 reading translates into 2,700 feet. A Liberty, N. Y., flyer reported he'd read 2,250 at the free-fall point. The State Police report said the chutist jumped from 3,500 feet, fell 1,000 feet with his first chute—and the balance on his own. All agreed, as did the spectators, that it was a fall of at least 2,000 feet.

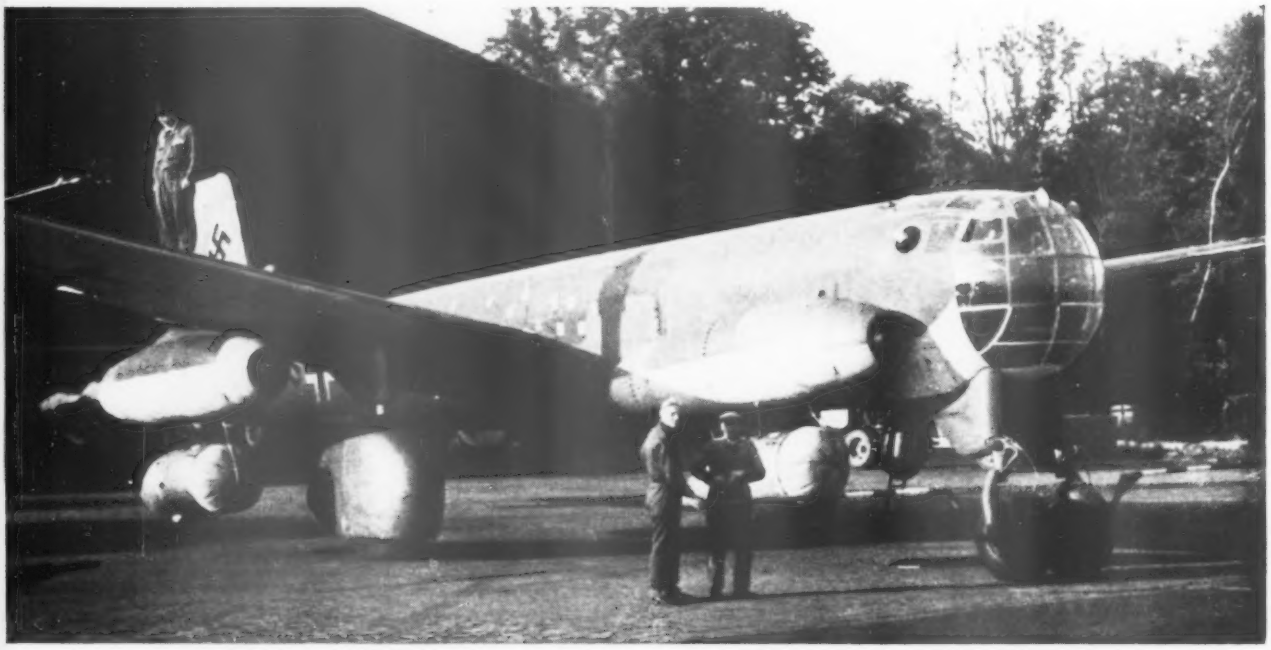
But then, Gabby's always lived dangerously. When the war started, he enlisted in the Army, was assigned to the Infantry—but quickly volun- (*Continued on page* 56)

U.S.-built Boeing XB-47 is second bomber to use swept-wing principle.

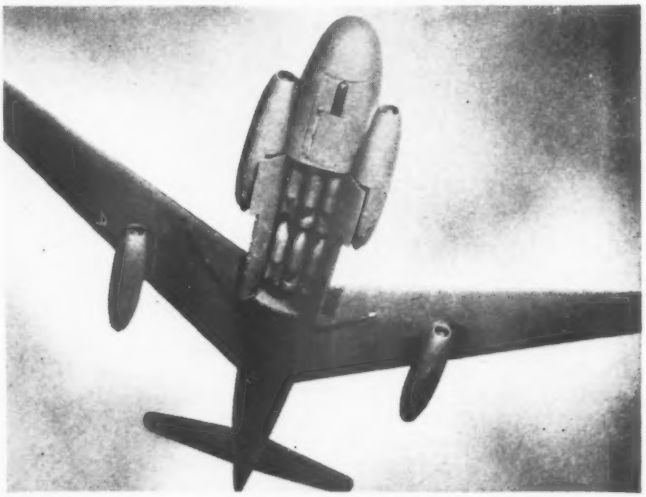
Swept-Wing Monsters

By R. G. NAUGLE

Project engineer, Bomber Branch, Procurement Division, Air Materiel Command



Prototype of Ju-287 displays unusual arrangement of four jet engines. Note the jet assist rockets slung under engine nacelles for take-off.



Unique high-speed bomb bay doors are demonstrated by plane model. Doors slide sidewise instead of hanging downward into the slipstream.

German Ju-287 seized by Russians has swept-forward wing.

IT'S A recognized fact that swept wings can delay and postpone the effects of compressibility to higher air speeds—so much so that wings swept 45° or more allow flight speeds close to Mach 1.0—the speed of sound, while a conventional straight wing would be getting into trouble at about Mach 0.7. However, since swept wings benefit simply by the fact that they form an angle to the airstream it actually makes no difference whether they're swept to the rear or to the front. Wings swept to the rear are more common but forward sweep works just as well.

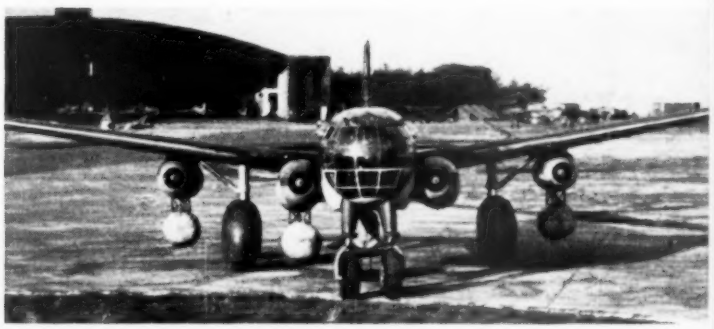
At the end of World War II, the Germans were striving mightily to take advantage of the swept-wing idea and had designed numerous experimental fighters and bombers with this futuristic shape. Their first sweptwing jet bomber, however—the Junkers Ju-287, had its wings swept forward. Our own Boeing B-47, on the other hand, the second sweptwing jet bomber to be built, has wings swept to the rear. While the aerodynamic benefits are similar for both planes, their overall arrangement is radically different—so much so that there is literally no similarity of any component.

It is understood that Russia, which captured the Junkers factory intact at (*Continued on page* 60)

Tufts attached to wing were used by Germans to study airflow.

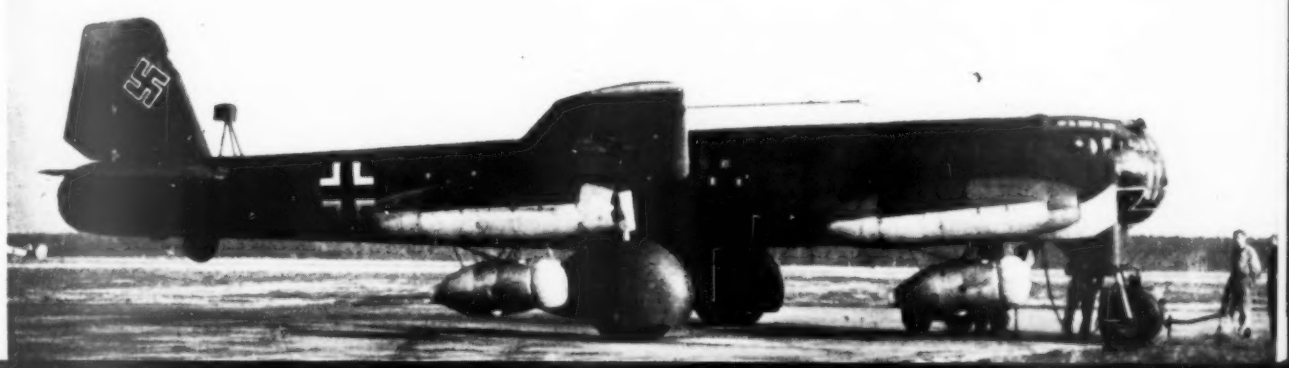
In flight, the swept-forward configuration of the Ju-287 is strikingly shown.

Parachute brakes speed of Ju-287 on landing—just as on B-47.



Dual nosewheels of the bomber were solution to space-weight problem.

Side view of Ju-287 shows tail wheel which protected plane on tail-low landings. The craft was 58 feet long, had gross weight of 50,100 lbs.



Lightplane dependability in mountains is attested by the author, who cites use of Navion at Stibnite, Idaho, at an altitude of 6,539 feet.

I'll Take Lightplanes in the Mountains . . .

'Sherred is wrong,' says operator, 'We prefer small planes.'

By GLENN E. HIGBY

Chief Pilot, Aircraft Service Company, Boise, Idaho

UP HERE in Idaho we've heard of Ambrose Sherred who wrote the article "Danger Lies Over the Mountains," in the February issue of FLYING. We understand he is an excellent mountain pilot, and we have heard him praised many times. But we absolutely disagree with the main points of his article in FLYING—that you can't fly "rules" in the mountains, and that big, high-powered planes are better for mountain flying than small personal planes.

This isn't just my opinion; it's backed by some of the best mountain pilots I know. When Sherred said that many persons would disagree with his viewpoints he sure said a mouthful.

Let me tell you about Stibnite. Stibnite is a mining community in the heart of our mountains. During the war, the Yellow Pine Mine at Stibnite produced 37 per cent of the nation's tungsten and 90 per cent of its antimony. At present about 250 persons are employed in open pit mining there.

Stibnite is about four miles south of Monumental Summit and about eight miles northeast of Big Baldy. It is 180 miles by road from Boise and the driving time is from six to 12 hours. During the fall, winter and spring, the roads are often impassable and aerial travel is a necessity.

Aircraft Service Company averages one trip per day the year round on routine passenger carrying and emergency trips to Stibnite. As a result of the heavy air travel many persons there have developed such an interest in flying that they have taken flight training and bought their own planes. There are about 15 students and private pilots in Stibnite at this time. In the past two years eight persons I know of have purchased planes. In addition, Bradley Mining Company owns and operates three planes.

Although this field has most of the disadvantages of a mountain field there hasn't been a single accident, even of a minor nature, by these students and private pilots while flying there or at any of the other many fields in the primitive area. Yet the Stibnite strip is 6,539 feet above sea level, lies in a dead end canyon, and has a prevailing tail wind for take-off. The runway is 250 to 300 feet wide and 2,600 feet long, but in winter the snow is piled along the runway above the wing tips. The field has the usual bad flying conditions of any mountain field—downdrafts, turbulence and poor approach. (*Continued on page* 28)

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DO'S AND DON'T'S OF MOUNTAIN FLYING

By BILL WOODS
Owner, Floating Feather Airport, Boise, Ida.

1. First and foremost, *never* fly the back country unless you have at least 150 hours and are proficient in slow flight.

2. Know your airplane. Do not take a plane into mountainous territory that will not take off and land in a minimum distance.

3. Remember that each 1,000 feet you are above sea level will increase your take-off run approximately 25 per cent and your landing speed two per cent with a corresponding increase in your landing run.

4. Know the field you are going into. Check with experienced mountain pilots if possible. Know the altitude, length, and whether it is a one-way field. Most Idaho mountain fields are one way and on many it is impossible to go around if you overshoot.

5. Check your weather and stay out of doubtful or bad weather.

6. Make your trips in the early morning hours. As a rule, the air begins to get bad around 10 a.m. and grows steadily worse until about 4 p.m., then gradually improves until dark.

7. Stay out of the mountains if the wind is over 25 m.p.h.

8. Keep your airplane light. Do not carry one pound of needless weight.

9. Route your trip over valleys whenever possible and study your charts thoroughly. Watch your compass and don't get lost.

10. Use common sense on take-offs. If the air is bad or if you have a tail wind, wait it out. Remember, none of these fields is long enough to land again once you have left the ground. Let the airplane use all the runway it needs as long as runway is available, then it will be flying when it leaves the ground. Unless you run out of runway, don't pull it off until you are sure of flying speed.

11. Maintain as much altitude as possible at all times.

12. Hit all ridges at an angle so you can turn away if you hit a downdraft. After you cross the ridge head directly away from it.

13. Expect the wind to be changing constantly in the mountains. Don't rely on cloud shadows for wind direction. If you can't gain altitude on one side of a canyon, try the other. If there is no improvement there ride the center, but under no circumstances head up any canyon or valley without sufficient altitude and room to turn around—the grade of the canyon may climb faster than your airplane.

14. Keep that flying speed in downdrafts. Don't get panicky, just remember that air does not go through the ground—a ground cushion of air will always be there unless below the top of the timber. The stronger the downdraft, the greater velocity it will have when it changes direction.

15. Remember that you will not have a horizon to check the altitude of your plane once you begin to let down in the mountains. Watch your airspeed and your altimeter. A good rate of climb is worth its weight in gold.

16. On landings, come in upstream whenever possible and with the airplane at minimum speed with power. If the plane is settling too fast add more power; if it isn't coming down fast enough cut a little power. But do not make power-off approaches. When you are sure you will hit the runway near the end, chop the power and make a full stall landing. These fields are short.

17. You can gain extra take-off speed by making your turn at the end of the field at a good fast taxi speed and opening your throttle as the plane swings around to line up with the runway. Practice this maneuver with an instructor on a good standard airport.

IN GENERAL

UNDER ordinary circumstances you can expect the wind to be blowing upstream in the mornings and afternoons as the air and terrain heats up and downstream in the evenings as it cools off. Cold air is heavy and goes down hill while hot air is light and goes up. Expect to find downdrafts over all streams, since they cool the air. Know the wind if possible; watch the topography and with a little common sense you can tell where the updrafts and downdrafts will be. Remember, air is like water and follows the contour of the land it is flowing over. Use the updrafts to help you gain altitude but do not fly a plane in this territory that does not have a ceiling sufficient to get you out without help from the updrafts.

Before you fly in mountains, practice short field landings with power, upwind, downwind, and crosswind. Be sure you can set your plane down on a 50-foot spot, not once in a while but *every time*. Take maps with you. Know your route and the weather. Let someone know when you are going, the route you are going to use, and when you will be back. Do not fly into any basins or valleys at high altitudes that do not have an outlet where you can get out in a hurry in case of downdrafts. Winds of from 40 m.p.h. and up are common at 10,000 feet altitude. Carry enough gas to make your complete round trip plus 50 per cent more. Above all, fly the airplane every second. Don't let it fly you. You cannot make mistakes in mountain flying.—*From "Your Skyway Map of Idaho."*

HOW TO LAND AT SOLDIER BAR

Soldier Bar (above) is a U.S. forestry strip at 4,190 feet altitude, and only 938 feet long. In landing (below) pilots must first drag field to note downdrafts and check pressure altitude because the approach must be started out of sight of the field. The landing is always made uphill toward the trees shown at the top.

Taking off from Soldier Bar (below) is simpler than landing. Take-offs are always down hill, even with a tail wind. Because of dips in field, pilots must hold tail high until they have plenty of flying speed. Pilots need not worry about running out of field, because they can dive off the end, turn, and go down the canyon.

These pilots do follow the rules of mountain flying and seek advice from experienced mountain pilots. To my mind, their success proves beyond a doubt that mountain flying "do's and don't's" are invaluable. The fundamentals of safe mountain flying are good pilot judgment, taking no chances with the weather, a thorough knowledge of the airplane, and *following the fundamental mountain flying rules.*

I showed Ambrose Sherred's article to Bill Woods, owner of the Floating Feather Airport just west of Boise. Bill is perhaps the most experienced mountain pilot in the world. Here are his comments:

"I say the lightplane, as far as its flying characteristics are concerned, is second to none for mountain flying. It is by far the most maneuverable plane in the sky where space is limited. It can get on and off of fields so short that it would startle a humming bird to watch it, and inasmuch as it is hardly more than a powered glider [Bill is speaking of light high-wing monoplanes in the *Cub,* Taylorcraft, Luscombe, Cessna and Aeronca class], its ability to take advantage of updrafts would surprise an angel.

"In flight it is slow enough that you are able to think as you go, either in strange territory or strange air. In case of a motor failure, its gliding distance is far greater than a heavier plane from the same altitude. It can land in a much shorter open space and, in case of a crash landing, its speed is much slower and more safe. And it is easy and safe to fly at much slower speeds than heavier aircraft, and is far less critical in marginal flight attitudes.

"Remember," Bill continues, "that we are speaking of flight characteristics only. It is true that it does not have the speed, nor the radius, nor the load-carrying capacity of higher-powered aircraft. Maybe in turbulent air it does a lot of bouncing around due to its lightness, but remember that same bouncing is considerably easier on a plane than the severe jolting you receive in a heavier plane. And that same lightness will let it land on rough fields again and again, where the same fields would start disassembling a heavier plane on its first contact with the ground."

Bill wants to make sure you understand what kind of country he is talking about. He means terrain "where the altitudes range from 5,000 to 10,000 feet and the landing fields are short, high altitude, uncared for and generally one-way strips, usually in the bottoms of the canyons."

For that kind of flying give him lightplanes.

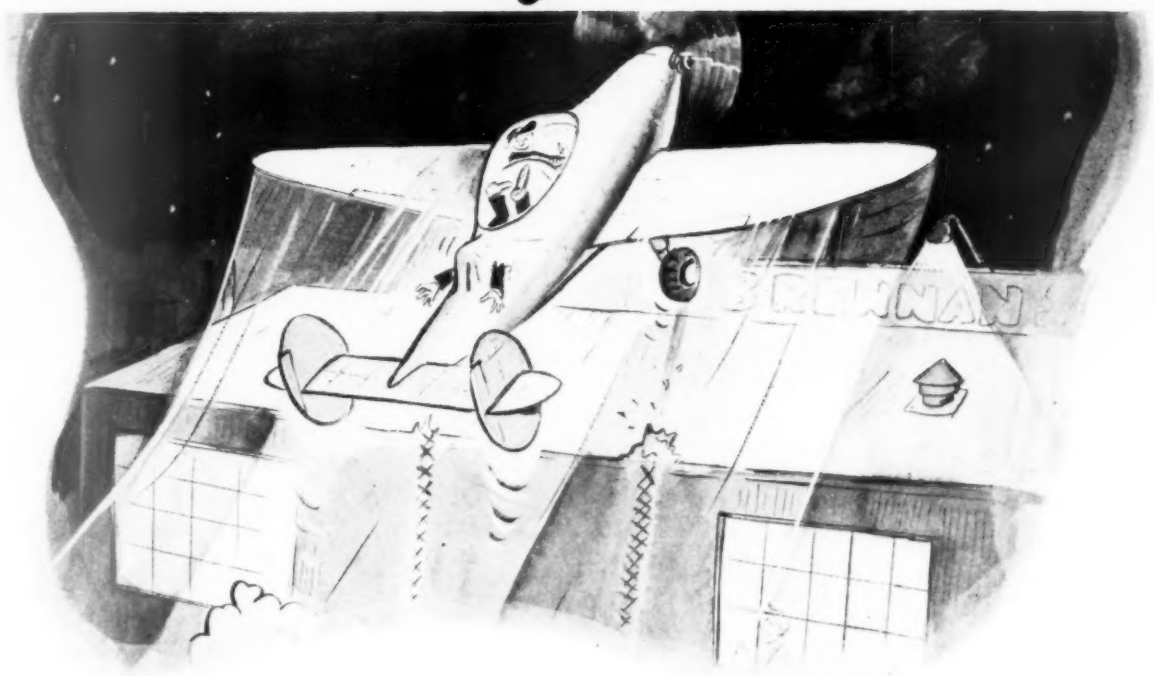
Bill's views are shared by Les Randolph, manager of Aircraft Service Company. Les has 4,200 logged hours, of which 1,500 are mountain flying.

He says: "Sherred's claim that a light airplane has little or no business in the mountains is, in my opinion, erroneous. During the past several years I have flown Idaho mountains in all sizes and shapes of airplanes, from *Cubs* through Curtiss *Robins,* Stinson *Detroiters,* Stinson *Voyagers,* Cessnas, Luscombes, Aeroncas, *Travelair* 6,000, Fairchilds and *Navions.* This is about as good a cross-section of airplanes as you can produce.

"Of all these different types, I felt safer in the light airplanes than the others, unless perhaps it is the *Travelair* 6,000, equipped with a 450-h.p. engine. The reason this airplane handles so well in the mountains is that it can land like a *Cub,* take off like a *Cub* and turn like a *Cub.* In other words, the lightplane's capabilities of this large airplane are its most valuable asset.

"In one paragraph of Mr. Sherred's article he says, 'at 11,000 feet above sea level your light slow landing airplane would come in like a clipped wing pursuit job, or a satchel full of bricks.' I wonder just how big a hole the 450-h.p. P.&W. on the front of his plane would make at 11,000. If you had your choice (*Continued on page* 71)

Your Passenger's First Ride



"**Hold her** on the ground as long as you can, then hoist her up past the factory windows."

He'll never forget that first hop if you follow these rules.

By C. B. COLBY

ONE of the nicest things about taking a passenger up for his very first airplane ride is the fact that he has no idea what to expect. No matter what you do it will be a thrill. Here's how to impress a "first flighter" with what a really hot pilot you are and how wonderful flying really is.

Once he has decided to go up, proceed as follows: do not find out in advance how high he wants to go, where he wants to go or what he wants to do. That would take away much of his pleasure in the hop and it certainly would cut down the element of surprise.

Before taking off with a first-flighter there are certain rituals to be observed. They help impress the passenger with the skill of the pilot and the miracle of flight. If there is a cloud in the sky always say you have to "check with Weather" before take-off. After you have apparently done so inform your passenger you are sure you can "get away with it okay." This will relax him for the hop.

Help him into the plane and be sure to adjust his safety belt. Pull it up until he begins to gag and then release slightly until only his lips are blue and he is nice and snug in his seat. That promotes a feeling of security. Now examine the exterior of the plane where the passenger can watch you do it. This will assure him everything is just peachy. Shake the wings briskly and keep going back to one wing in particular for another shake. If a mechanic happens to be handy point to the wing and mutter something under your breath he can't possibly hear. He will ask you over again and you can mutter it again even more unintelligibly so that he will walk away shaking his head. The passenger will love it.

Waggle the ailerons briskly so that he can see the stick move about the cockpit or cabin. After his knees have stopped stinging go to the rear of the plane and snap the elevators up and down several times. You may miss him completely but it will demonstrate the mental alertness and abdominal agility aviation requires.

Back in the cabin, inspection over and your safety belt fastened, get the engine started. Once it has caught, keep fiddling with the instruments, choke and throttle. Switch from mag to mag and back again with a look of grim concentration. This will impress your first-flighter with the importance of a good engine and a pilot who understands it. If you switch mags slowly enough an interesting skip can be produced. This fascinates a first-flight passenger.

When you taxi out to the end of the runway come as close to other parked and moving aircraft as you can. It will show the marvelous control you have over the aircraft and give him a chance to see the other planes close to. Don't bother to "S" along the taxi strip. He might think you can't steer straight (*Continued on page* 76)

Tense moment in free flight of speedy parasite comes when it approaches "mother" B-29 (top), maneuvers into position and hooks on to the trapeze below bomber. In combat, a B-36 will carry XF-85.

Midget jet fighter takes off and lands on a Superfortress.

THE two *Superforts* drone steadily above the hot flat stretch of Rogers Dry Lake at Muroc. The silvery Lockheed *Shooting Star* "chaser plane" follows behind, throttled down uneconomically, for the fast jets don't cruise well at B-29 speeds. In the radio shack at base there is tense expectation as the radiomen listen to the talk between the two big bombers, the F-80 chaser, and a fourth plane which somehow doesn't seem to be in sight.

You listen in on the talk. You hear one *Superfort* saying, "Prepare to drop." You squint at the sky and wonder if you'll see the bombs as they fall and where the target is. The planes are almost out of sight now, but they come swinging back. You hear somebody say, "Drop in four minutes." Four minutes? What kind of bombing is this anyway? You'll soon find out, because four minutes ought to put the two planes pretty close to overhead.

"Any time you're ready, Ed," the B-29 says. And you hear that strange fourth voice that you can't locate saying, "Release in 20 seconds."

All of a sudden you see four planes instead of just the two 29s and the 80. The fourth is a tiny fat bumblebee, like a barrel with short wings. It appears magically in the air beneath the lead *Superfort* and suddenly shoots away. It makes the big bomber look silly—almost standing still. The F-80 gives chase, but you see daylight grow between the two planes. This little baby is fast.

Standing outside the radio shack you take off your earphones and watch the aerial play overhead. It wasn't bombs that the *Superfort* dropped, but the Air Force's new experimental fighter—the McDonnell XF-85.

Stubby XF-85 is dwarfed by giant B-36 (above). Jet parasite will ride in bomb bay of big bomber.

-BUG ON A TRAPEZE

The XF-85 is a parasite, designed to be carried inside the bomb bay of the Convair B-36 and other future super bombers. It operates from the world's highest landing field; it is launched from and hooked back onto the mother plane in cruising flight. In its experimental flights, the XF-85 is using a B-29 as its "mother."

The two XF-85s which have been built so far are undoubtedly the most unorthodox planes in the Air Force's stable of new jets. They have no wheels of their own, for what need are wheels when you land in the clouds? When it must descend to earth it can be cradled in a specially-built dolly and rolled along the ground. The plane has a belly skid for emergency use.

The bomb bay of the B-36 is only 16 feet long. McDonnell therefore had to design its parasite fighter so that it would be no more than 15 feet long. Its swept wings have only a 21-foot span and must fold completely to fit within the narrow bomb bay space. They also have to unfold while the XF-85 is hanging from its hook in a 300-m.p.h. airstream. So that the tail also need not fold, McDonnell developed a sort of "bent X" tail configuration. This is now being modified so that more (*Continued on page* 68)

Test Pilot Ed Schoch (below) was first to fly the powerful little jet. The parasite (shown at right on dolly used for ground transportation) has a J-34 jet engine with 3,000-pound thrust.

New fuel injection systems end engine icing problems.

Fuel Injection For Lightplanes . . .

By KURT RAND

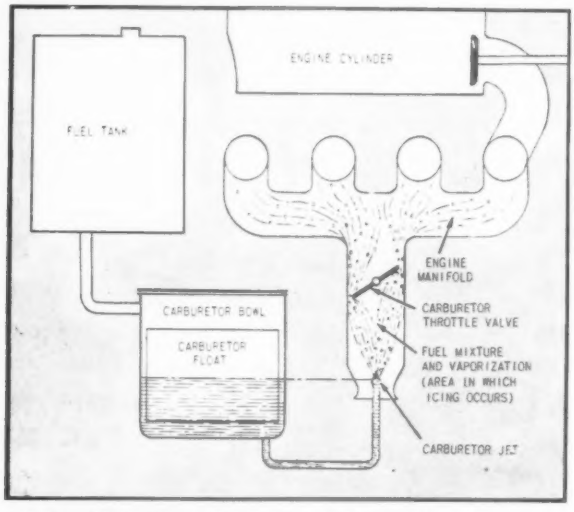
Why Carburetors Ice

IN ORDINARY float type carburetors, a tube is inserted into the airstream of the induction system. The velocity and mass of the air itself, as it passes by, draws gasoline from this tube. The liquid gasoline becomes a vapor as it goes into the air and is distributed to the various engine cylinders.

It is a basic law of physics that the addition of heat is required to change a liquid into a vapor. Most of this heat must come from the air itself as it passes through the carburetor and manifold. The act of extracting the heat lowers the temperature of the air and surrounding materials. The induction system thus is a miniature refrigerator.

All air contains water vapor. As the air temperature becomes lower, its ability to hold water vapor decreases. Finally, when the air is cooled enough, the water vapor condenses on the walls of the carburetor or manifold just as it condenses on a cold window in winter time.

The temperature of the carburetor and manifold may be lowered enough so that the condensed water freezes and forms ice. For this reason, carburetors are equipped with a device to pre-warm the air before it enters the carburetor. In fuel injection systems, the gasoline and air are mixed in the engine cylinders themselves. There is an ample source of heat to combat the refrigeration process here, obviously, because the cylinders are constantly firing.



Schematic diagram of carburetor fuel system shows icing area and explains why distant cylinders receive leaner gas mixture.

YOU make a touch-and-go landing, pour on the coal and climb out, then continue in the practice pattern. She seems a bit sluggish, and are those r.p.m.s dropping? Maybe a little. But the engine sounds fine on the down-wind leg and you know your gas tanks are full. Must be your imagination. You cut the throttle, turn cross-wind, and all of a sudden you are looking ahead through a windmilling prop. Your engine is deader than a mackerel.

Carburetor ice!

How could that be when the sun is shining brightly and it is warmer than 50° outside? Easy enough, you remember in dismay, because vaporization of gasoline in the carburetor and manifold can refrigerate the air in a hurry. A drop of 30° or more is not uncommon. If the air is moisture laden, the moisture can freeze, choke up the induction system and suffocate your engine.

You're lucky that your practice pattern is pretty good, and you glide on into the runway without any trouble. But suppose you had underestimated the wind? Suppose your pattern had been bad? You might have rolled up into a ball. And all because you forgot your carburetor heat.

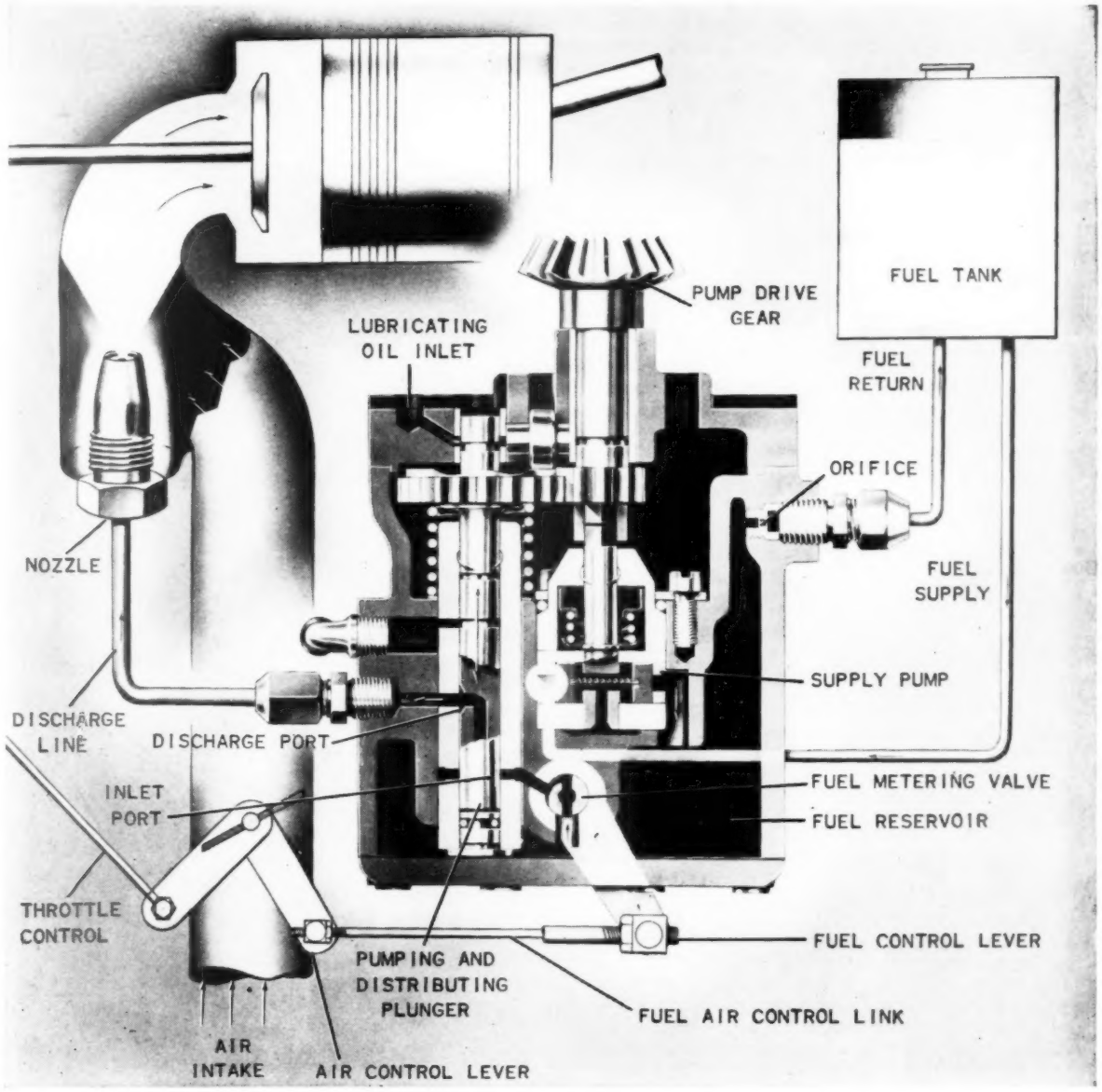
During one 30-month period, the CAA recorded 919 fuel system engine failures in small aircraft operation. About 90 per cent of these failures were caused by an engine stall at idle or by carburetor ice. There were 495 idling failures and 318 carburetor ice failures. All other fuel system failures totalled only 106. Every one of the idling and carburetor ice failures could have been prevented by fuel injection systems.

Fuel injection systems are already standard on some lightplanes. They are inexpensive and they have many advantages in addition to the two enumerated above. The most important advantages stem from the fact that with fuel injection, the fuel is separately metered and delivered to each engine cylinder so that an equal distribution of fuel to all cylinders is automatically obtained.

Thus the lean hot cylinders which are not unusual in carburetion systems are eliminated when fuel injection is used. The fuel mixes with the air at the intake ports, and vaporization takes place as the mixture passes into the cylinder. This also helps cool the cylinders. Pistons, rings and valves operate at a lower temperature, hence failure is less likely to occur and engine life as a whole is increased.

Another result of fuel injection is that engines equipped with it usually save on gasoline. Enough fuel must be delivered to lean cylinders in carburetion systems to prevent them from overheating. Therefore there tends to be fuel waste in the rich cylinders. Engine idling also tends to be better with fuel injection and danger of engine stall in a glide is eliminated.

Similarly, engine acceleration and power are improved. Uniform fuel distribution helps this. During a glide an aircooled engine cools rather rapidly. The induction



FUEL INJECTION SYSTEM FLOW DIAGRAM

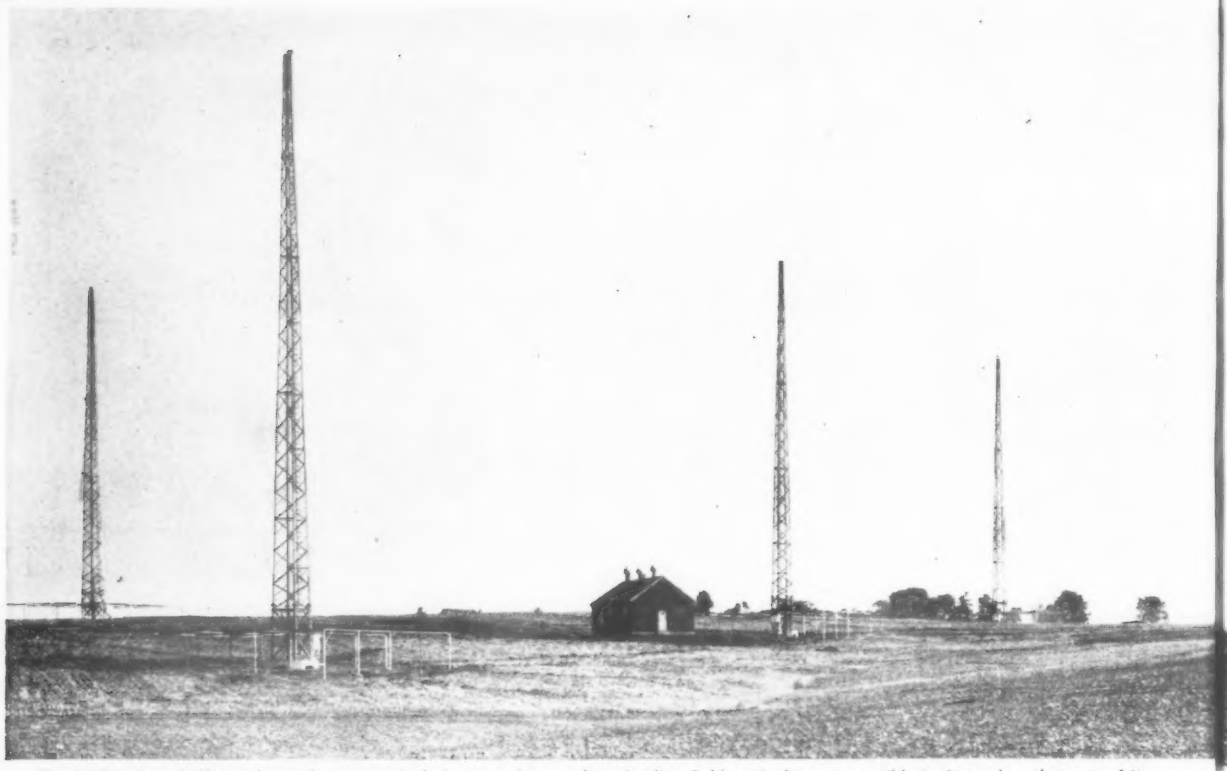
The Ex-Cell-O fuel injection system consists of four basic units, a fuel metering and injection pump, air metering throttle and control linkage, discharge lines, and atomizing nozzles. The gas enters air stream as it passes through the engine intake valve.

system especially becomes so cold that gasoline from a conventional carburetor system precipitates on the inner surfaces of the induction pipes instead of reaching the cylinders. Engine failures often occur as a result.

The fuel film on the interior of induction pipes varies with wide open throttle, part open, and idle. After a prolonged glide, and before an engine can respond to an opened throttle, the fuel film on the interior of the induction system must be reestablished. This requires time and is responsible for "throttle lag." That's why it's necessary to open the throttle occasionally during a glide with a carburetor system. In a fuel injection engine, however, the induction system is divorced from the fuel system. Idling is improved and subject to fewer variables, and when the throttle is opened the fuel injection engine responds instantly and with no lag whatsoever.

Engine power is increased for several reasons. The cooler cylinders contract the residual gas of the former explosion and allow a heavier charge of air to be inducted. Fuel injection eliminates loss of power caused by use of carburetor heat which pre-warms the induction air. Elimination of de-icing equipment also makes possible an air intake leading directly forward through the air filter, increasing air ram in flight. "Flat spots"—those small speed ranges where the proper fuel-air ration is not obtained with carburetor systems—also are eliminated by fuel injection.

Because of these many advantages, engines with fuel injection generally run smoother, fly faster and safer. Engine installations with fuel (*Continued on page* 74)



Typical range station is located near terminal airport or intermediate landing field, and whenever possible is situated so that one of its beams lies along the principal runway, facilitating low-visibility radio approach landings. The center tower is used for voice broadcasts.

By BEN ROBIN

ASK any old time pilot the question "Have you ever been lost?" The answer will always be the same.

"Sure, and anybody who hasn't has never flown cross country."

This answer may not be entirely true, because if a pilot has a beam receiver and understands its use, there is no reason why he should ever get lost.

A beam receiver should cover frequencies of 200 to 400 kilocycles, and should be operated preferably from self-contained batteries. If you own or fly a *Navion*, Beech, or other plane equipped with radio, this battery-operated portable can provide beam reception even if the plane's radio or electrical system goes haywire. If your plane has no other radio installation, then this low frequency range receiver is a navigation must unless you, too, intend to get lost sooner or later.

Today, the boys are raving about VHF, VOR, FCC, and a great many other radio term abbreviations. To be hep to this jive requires an engineering dictionary. To make use of these new high frequency facilities requires a lot of expensive, and sometimes weighty or scarce equipment.

Meanwhile the old standby frequencies from 200 to 400 kilocycles are still putting out radio range aids to navigation night and day, through fair weather and foul. The popular 278 kilocycles tower frequency still guides hundreds of private planes daily onto the runways of the 48 states. In contrast to VHF equipment, a low frequency beam receiver can be purchased today, complete with batteries, at a nominal figure.

Flying and radio magazines list new, used, and Government surplus receivers for sale. Just be sure that the set you buy tunes from 200 to 400 kilocycles and operates from its own battery supply. Some of these receivers include a 110 volt AC or DC plug for use at home or in a hotel room during trips. This feature lengthens battery life but usually increases the receiver's initial cost.

If your plane is equipped with antenna and shielded plugs, your installation job will present few problems. Metal planes with engines completely enclosed sometimes require little or no shielding. A friend of mine who owns a Piper *Cub* with no shielding at all uses a small range receiver with a short belly antenna strung between landing gear and tailwheel. He gets satisfactory results and wouldn't venture beyond the airport flight pattern without his little receiver aboard.

I shall never forget a chance meeting with an acquaintance several years ago. We were both employed as ferry pilots by a large aircraft corporation. I met Andy in the factory operations office, preparing for a flight from our midwestern base to Miami, Fla. He was a co-pilot at the time and had little experience flying by radio. He knew that I held an instrument card and used radio equipment religiously when delivering the big twin-engined jobs we were ferrying. Andy was sprawled on hands and knees, attempting to draw a straight line about six feet long across several sectional maps. I couldn't restrain a laugh as he looked up. I asked him where he was headed.

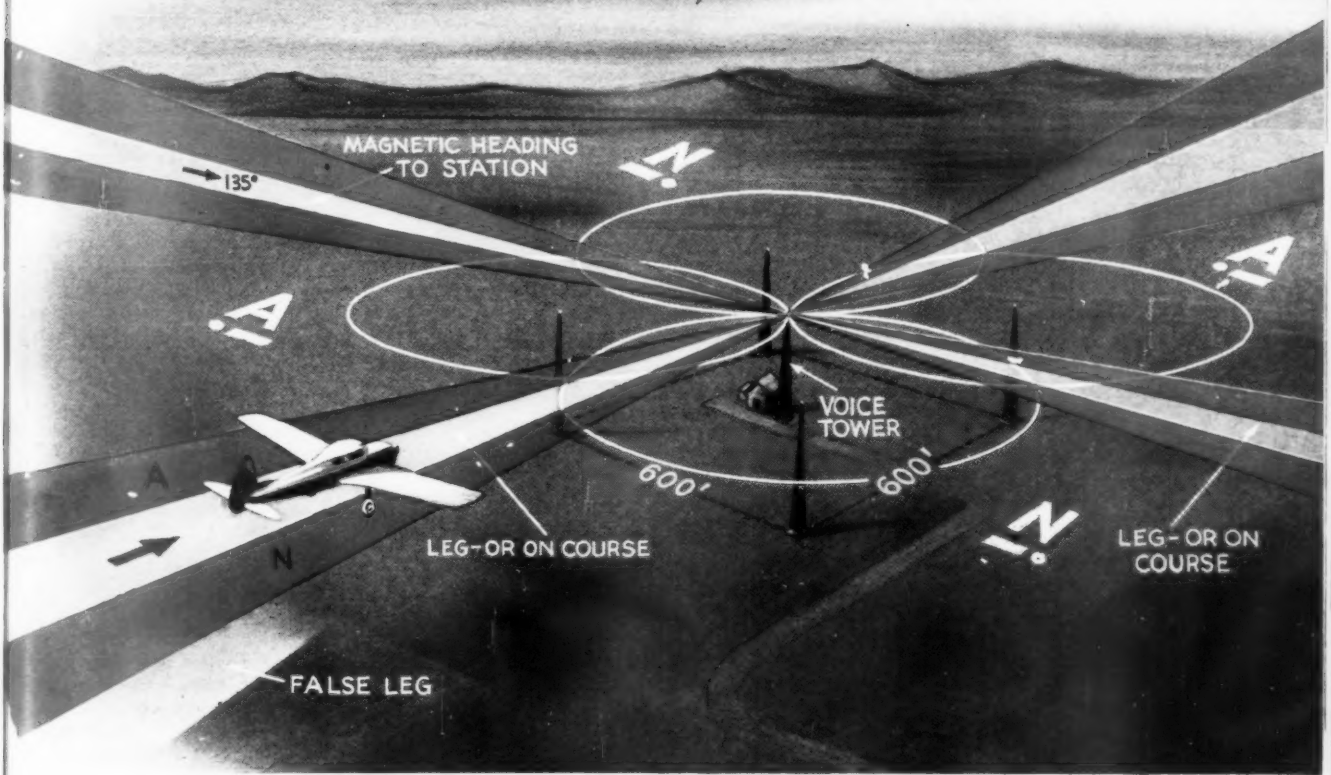
"From here to Miami, Ben" he answered. "And I wish you would tell my pilot how to navigate by radio."

It seemed that Andy's pilot was a fine fellow but he didn't believe in using a radio. (*Continued on page* 62)

GET ON THE BEAM

Old-fashioned beam receiver will still keep you from getting lost.

Artist's conception of typical range station (below) shows the four legs, which coincide with established airways. Plane flying center of beam hears continuous signal.



Paratroops and airborne armies will be landed in enemy strongholds after bombers have destroyed foe's will to resist, Colonel Purcell says.

Decision by Air

It's old-fashioned to talk of hand-to-hand combat and bayonets. Modern armies can 'close with enemy' by using bombers, says author.

By Col.
F. X. PURCELL, Jr.
United States Air Force

Can long-range bombers like these B-50s pound an enemy into submission without infantry help?

A GENERATION ago, a crusty old general delighted in telling his troops the story of a Roman mother and her soldier son. The boy complained that the enemy had technological superiority—they used long spears while the Romans had only the old-fashioned short sword. The mother looked down her Roman nose and said, "Son, move up closer."

The general and the old lady were both propounding the principle of "closing with the enemy" which means coming into contact with the enemy in such a way that he has no choice but to yield or die. The old infantry interpretation of this was the bayonet, and the cavalry interpretation, the sabre. In the naval warfare of the Spanish Main, these tactics had their counterpart in the ramming of one ship by another and in the lashing of two ships together while the mariners hacked it out with cutlasses, dirks, and belaying pins.

As naval weapons increased in range and power, individual combat at sea became more and more rare until, in the First World War, when purely nautical combat probably reached its zenith, fleets closed with each other at a distance of 20 miles or so, and if the hostile mariners ever saw the whites of each others' eyes, it was in the realm of Davy Jones.

In World War II, fleets closed with each other at a greater or lesser range, depending upon how you look at it. The surface ships were farther apart—often hundreds of miles—but individuals often came into much closer range. The range, in this case, was vertical.

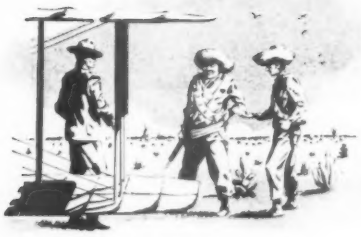
As the range and power of weapons increase, we must constantly remind ourselves that the basic principles of war do not change. But we must also be alert to redefine the terms in which we express them. "Closing with the enemy" does not necessarily mean the bayonet; it once meant the strangling hand and ripping tooth and before that, if we can believe the extreme evolutionists, it was just a splash in the primordial slime. Fundamentally, it is a state of mind—the willingness to slug it out to the bitter end. This willingness may be expressed by an engineer soldier crawling on his belly through a minefield, probing for deadly explosives. It may be expressed by a *Kamikaze* pilot, diving his airplane into a battleship. It may be expressed equally by a bomber pilot flying through flak to reach a target 10 miles below him, or by a task force commander advancing from base to base across the polar ice cap to come within lethal range of the enemy's war potential.

It is still necessary to carry the fight to the enemy's homeland and to give him the choice of submission or death, but we no longer have to accept the infantry definition of terms. The bayonet may soon be as dead as the sabre and the cutlass.

Now, this is not a plug for a new and more scintillating crystal with which to gaze beyond push-button war into the realm of pure magic. Our best scientists and most responsible military men have warned us that even the atomic bomb has limitations and that long-range guided missiles are a long way off. Any war in the next few years will be fought—or at least begun—with the weapons developed in the last war.

The capacity of those weapons is pretty well established. At the time of Pantelleria, there were those who claimed that the surrender of that small island to air power alone sounded the death-knell of surface forces. That is probably an overstatement, but the Pantelleria attack furnished a pattern for later aerial (*Continued on page* 66)

Jen pilots helped Pershing chase Pancho Villa south of the border.



The Jennies and the Bandits

By HARRY VAN DEMARK

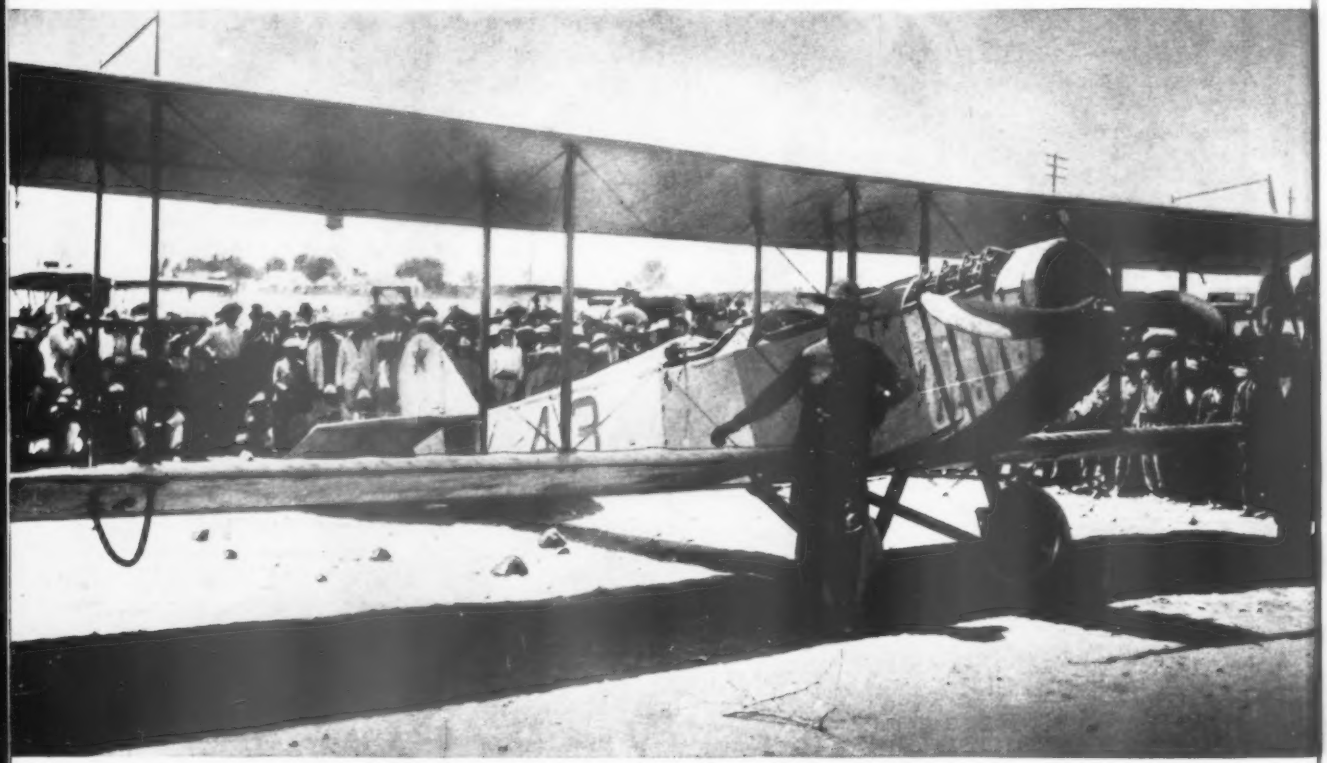
CAPT. B. D. FOULOIS was one of the first at Fort Sam Houston, Tex., to hear the news that day in early March, 1916. "Pancho Villa's crossed the border. He raided Columbus, N. M., burned the place—and killed 16 people!"

In minutes, the word was passed through Foulois' entire First Aero Squadron, Aviation Section, Signal Corps. Each of the unit's 10 officers, 82 aviation enlisted men—even the two medical corpsmen and the civilian mechanic—excitedly speculated. "What'll President Wilson do about it? Will he let Villa get away with it?"

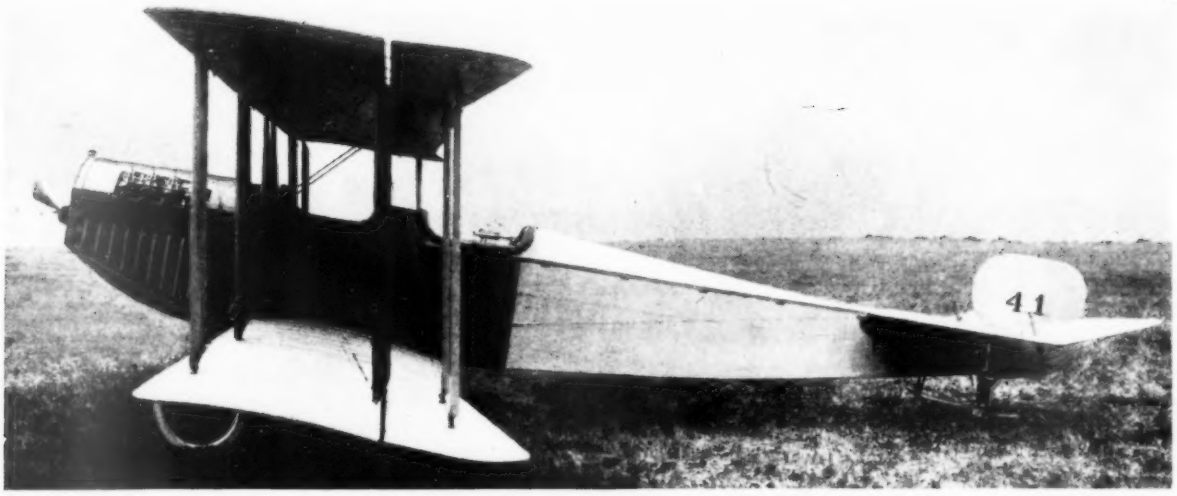
The answer came soon. Next day, President Wilson ordered Gen. John J. Pershing to enter Mexico to capture the bandit.

And on March 13, the First Aero Squadron flew its eight Curtiss JN-2s (predecessors of the JN-4, from which the name *Jenny* is derived) down to Casas Grandes, Mexico, about 110 miles from the border, to join "Black Jack" Pershing.

There they became the first airplanes to serve with a U. S. military expedition. Even the 10 pilots didn't know what they were getting into. The *Jennies* didn't carry



Lieut. H. A. Dargue and Jenny pose for Mexican photographer at Chihuahua, just after being stoned by belligerent crowd. To avoid further violence from the mob, Dargue spent 30 minutes posing and re-posing for this historic photo. Plane is a JN-4, successor to original JN-2s.



Curtiss JN-2, one of eight flown on Mexican border, had top speed of 80 m.p.h. on a 90-h.p. OX engine. Ten were built for Signal Corps.

machine guns and they didn't have bombs. But they were top-rate reconnaissance machines.

As one general pointed out:

"Villa parties will at times surprise ground scouting parties. In ordinary warfare our men might, if hopelessly outnumbered and resistance were futile, surrender with safety. To surrender to Villa, however, would be worse than suicide. Villa's men will kill every American they can lay their hands on. Every encounter with them means a fight to the death for our men."

So the first Aero Squadron was sent to spot the bandits from the air. The eight small, low-powered scouting planes could fly only about 50 miles from their base. Instead of stick-and-rudder controls, they contained a wheel set on a movable bar in front of the pilot. To bank the plane, the pilot had a pair of yokes resting on his shoulders. For a right bank, he leaned to the right, and vice-versa. The throttle was actuated by a foot plunger similar to the accelerator on automobiles.

Capt. B. D. Foulois, who later became Chief of Air Corps with rank of major general, is shown in rare picture taken while he served with Pershing.

The crude craft were in deplorable shape. Within two weeks only two remained in flying condition—but those two planes were trail-blazers in military aeronautics. The 10 pilots used them constantly. By April 22—less than six weeks after the expedition started—even these two planes were out of commission.

But while they were active, they did workhorse jobs. Among the most daring of the pilots was Lieut. Herbert A. Dargue, who putt-putted daily over the desert in his underpowered JN-2 (which could carry so little weight that, with an observer, it was impossible to take along food and water).

Dargue's personal exploits read like a Dime Adventure Novel:

Once he located a lost column of cavalry, heading them into an attack on Villa himself.

On another flight, he took the first photos ever made from an airplane in actual field service conditions.

Soon after that, he set an American record for distance flights with two persons when, with Lieut. E. S. Gorrel, he managed to keep his *Jenny* in the air for 315 miles.

About a month after the squadron joined Pershing, the general decided he needed photographs and information about the roads north and west of the Mexican city of Chihuahua. Dargue and Capt. R. E. Willis warmed up their *Jenny*, headed into the wind, and started for Chihuahua. About dawn they circled over the city and started taking their photos. Willis would lean over, stick his hand camera over the side, and snap the pictures while Dargue held the plane in a precarious bank. Then they headed west, scouting for roads in the mountains. The old *Jenny*, Dargue later related, was laboring for altitude, and they actually brushed treetops on the peaks.

Everything went well, however, with the *Jenny* holding up until they passed over a precipice and hit a violent updraft. That was the end. It bent the crankshaft and put the engine out of commission.

They crashed into a clump of trees, breaking the fall. Dargue was unhurt, but Willis had a bad scalp wound and a twisted ankle. The *Jenny* was upside down and Dargue finally managed to extricate Willis from the wreckage—a 45-minute job.

So there they were, a substantial chunk of the U. S. Air Force, stranded in the middle of bandit country. Gathering their few pieces of equipment they decided to head for San Antonio de Aranalis, some 300 miles south of the border, where the Americans had a base.

Even in those days pilots didn't like to walk. They trudged, night and day, without food or water. The sun baked their heads and shoulders (*Continued on page* 52)

If you've got adventure in your blood, fly to the land of the Navajo Indians.

A FLYING Holiday

Colorado River Country

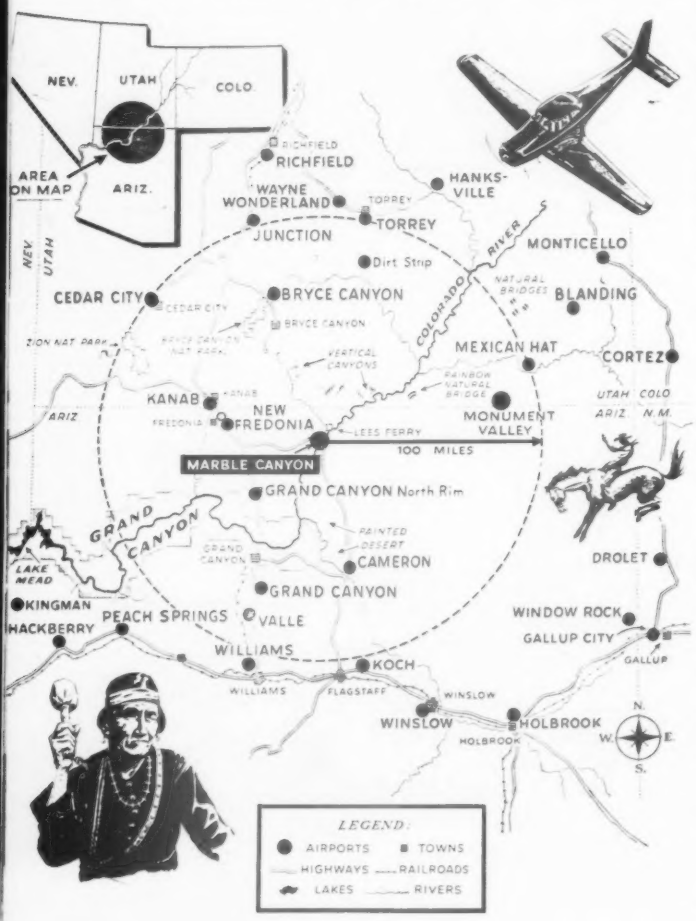
By BOB ARENTZ and HAL RUMEL

IN THE Colorado River Country, down on the Utah-Arizona border, Art Green runs the Marble Canyon Lodge and airstrip. About 80 miles east, Harry Goulding operates the Goulding Trading Post and Lodge. If you're tired of molly-coddled vacations in travel-folder resorts, these two desert hostels are the perfect FLYING Holiday destinations for April or May.

You won't find cocktail lounges, swimming pools or night clubs with a chanteuse for entertainment. But you'll fly through a land of mystery and solitude, of color and spectacle, of desolation and vastness.

It's a holiday destination for experienced pilots who know cross-country technique—and who still have adventure in their blood.

Art Green's Marble Canyon Lodge is located at the west end of one of the world's highest bridges—the Navajo, spanning the 800-foot walls of the Colorado River only a few miles north of the Grand Canyon. It is seven miles south of the old outlaw crossing called Lee's Ferry and 30 minutes flying time from Navajo Peak, the Rainbow Bridge, the Painted Desert and world-famed Point Imperial on the north rim of Grand Canyon.



Marble Canyon air strip, 3,580 feet above sea level, is nearly a mile long, with a smooth, hard, natural surface capable of accommodating airliners. You can taxi to the door of modern lodges and cabins and tie your plane to the porch pillars. Automobile transportation is available to historic Lee's Ferry, Houserock Valley and the Arizona State Buffalo herds, and down into the Painted Desert along the canyon's eastern rim. A few miles south, on the east side you'll see from the air two great holes, literally punched down into the earth, about 300 yards in diameter and hundreds of feet deep. The holes verge on the canyon's vertical cliff itself, yet there are no apparent connecting tunnels or caves. They are among the most mysterious geological phenomena in America. There is cat-fishing in the river and boating, if you want to loaf for a day or two. If it's worth $100 to see a natural bridge big enough to hold the nation's capitol dome under its arch, Art Green will have a propeller-driven boat available this year to make a 70-mile trip up the river to the canyon that holds the Rainbow Bridge's world famed grandeur and you'll only have to walk seven miles to see it.

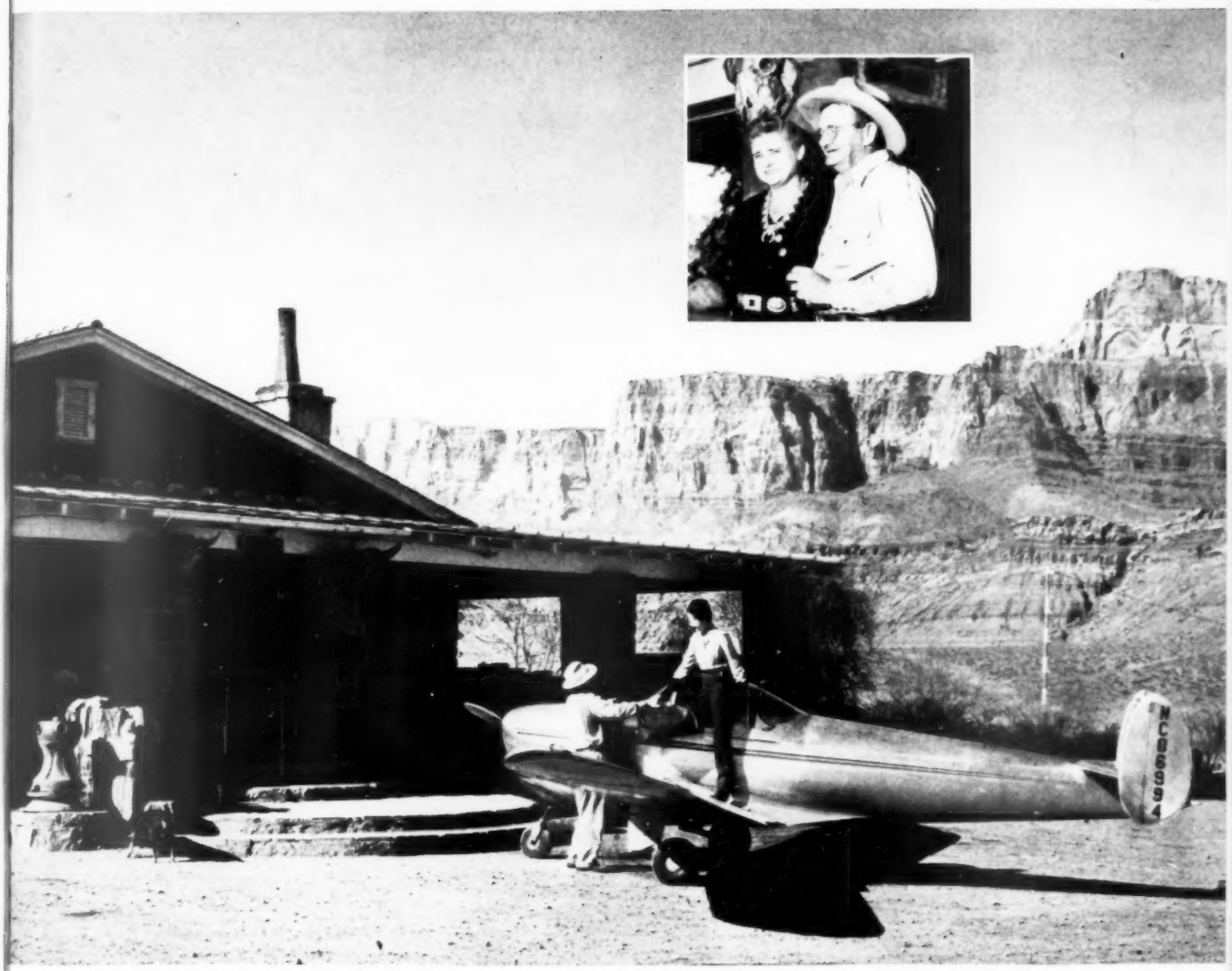
A trading post and store handles Indian silversmith art work, Navajo blankets, souvenirs, dry goods and food stuffs. Excellent meals are available at regular prices and lodging costs from $3.50 to $12.50 a night, depending on the size of lodge you want. Buildings are all modern and equipped with electricity from a private power unit. It's about 60 miles to the nearest telephone, but there is a good highway in both directions.

About 80 miles east of Marble Canyon, at Goulding Trading Post and Lodge, another good airstrip lies at the north edge of Monument Valley—the Valhalla of western picture producers. The strip is 3,500 feet long, elevation 5,284 feet and it, too, runs directly up to excellent lodge and camp accommodations. You almost always land uphill, regardless of wind.

This is the heartland of the Navajo Indian tribe and operator Harry Goulding and his wife speak the native tongues fluently. They share with Art Green a love for the country and the natives, and they offer a hospitality second to none on earth—if you measure up to their estimation of "good people," meaning straight-forward, honest and unpretentious.

The Navajo Indians, for all their poverty and neglect by the Government, are among the world's proudest people. Don't pull any "I am a great and mighty birdman" stuff on them and you'll get along swell.

Meals, served family style at Goulding's, are something worth writing home about. They (*Continued on page* 69)



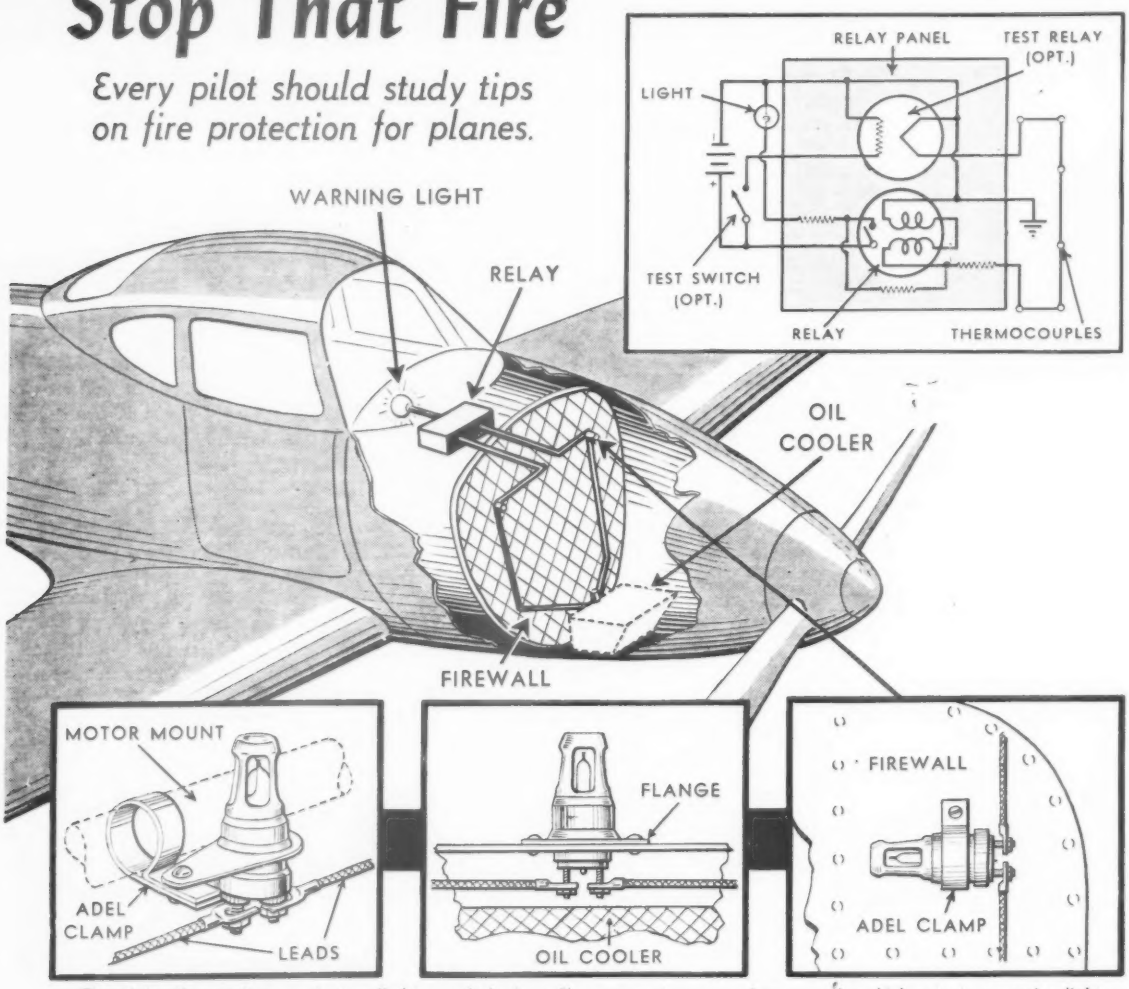
At Marble Canyon Lodge in center of Navajo country, Mrs. Louise Rumel of Salt Lake City lands in Ercoupe, taxis to lodge door. She is met by Art Green and wife (inset) who operate the resort and airstrip. Overnight accommodations cost from $3.50 to $12.50. Strip is mile long.

Natural wonders such as this double arch in Arches National Monument near Moab, Utah, are found throughout the scenic Colorado River Country.

Navajo Bridge, one of the world's highest, spans Colorado River at Ma ble Canyon Airstrip. Lodge and strip can be seen at upper right of phot

Stop That Fire

Every pilot should study tips on fire protection for planes.



Fire detection system can be installed in any lightplane. The system above uses thermocouples which actuate a warning light.

By DAVID H. MOORE, Jr.

OF THE three natural enemies of power driven aircraft —ice, gravity, fire—the latter is the most hazardous for the personal plane. Until comparatively recently, a fire of any magnitude in a personal plane immediately presupposed the loss of that plane.

Because the personal plane represents more than a casual investment, and because of the increasing importance of aircraft fire protection, personal plane owners should know how to reduce fire hazards.

This discussion concerns itself solely with fires forward of the firewall, in the power section proper. The fire hazard caused by such things as careless smokers in the cockpit, and electrical shorts in refueling, require common-sense precautions and are the responsibility of the pilot. The basic systems below may be used on all personal planes now flying or in production.

Chief causes of power plant fires in lightplanes:

1) Faulty hose connections.
2) Accumulations of oil vapors.
3) Leaking fuel valves.
4) Combustible materials in plumbing forward of the firewall.
5) Ignition of fuel vapors by electric sparks.
6) Cracks in the manifold.
7) Traveller flames and fire-tails clinging to the outside skin.
8) Cylinder failures.
9) Location of exhaust stack on right side of power plant.
10) Tight shrouding around oil cooler and manifold.

Planes partially constructed of doped fabric naturally have a greater hazard, but the use of such items as micarta fairleads, magnesium strips and trims, straps, etc., forward of the firewall even on all-metal planes constitutes a serious fire hazard.

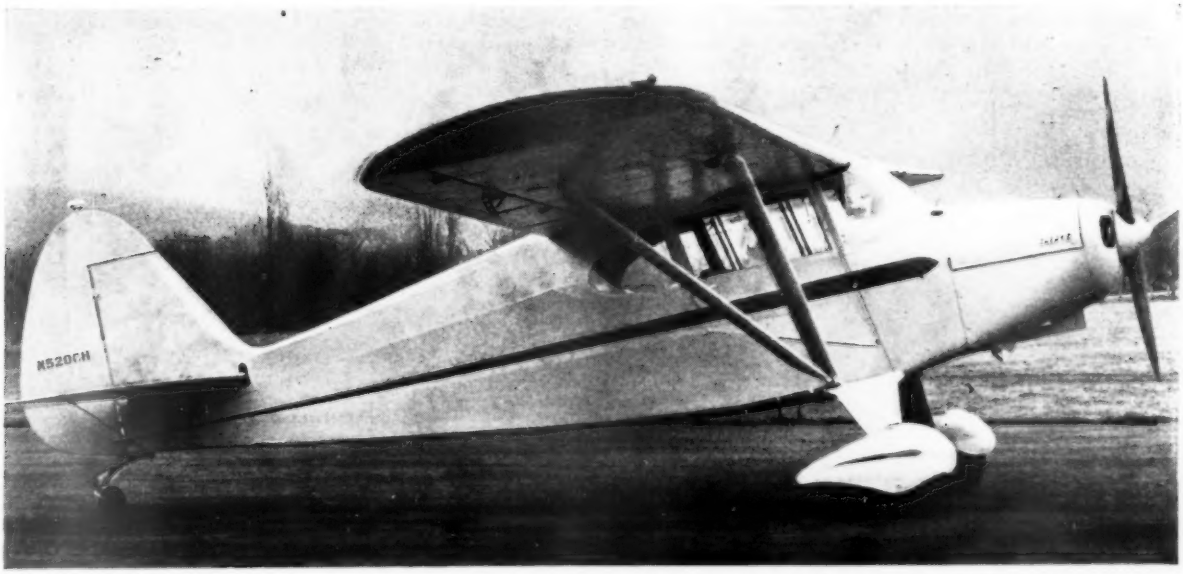
Very light planes cannot use fire extinguishing systems to advantage due to the added weight, expense (relative), and the impracticality of a fixed installation. The Piper *Cub* is an example. However, every type of personal plane should carry a fire detection system with a *blinking* red light on the panel, especially where night flying is anticipated. When fire actuates the warning light, it is then up to the pilot to bale out or attempt to ride it down with a *dead* engine. (A basic detection system is detailed in the illustration on this page.)

The detectors recommended (*Continued on page 73*)

1949 Ryan Navion has many new features including fairings for main gear strut wells; nose gear doors; engine exhaust through cowl gill, carrying engine noise below the wing. Rear seat has high head rest roll for passengers. Antennas have reduced drag.

Skandinavsk KX VII "Lark" is Danish four-place plane with 125-h.p. Continental engine. It cruises at 115 m.p.h. for 450 miles.

HAVE YOU SEEN?

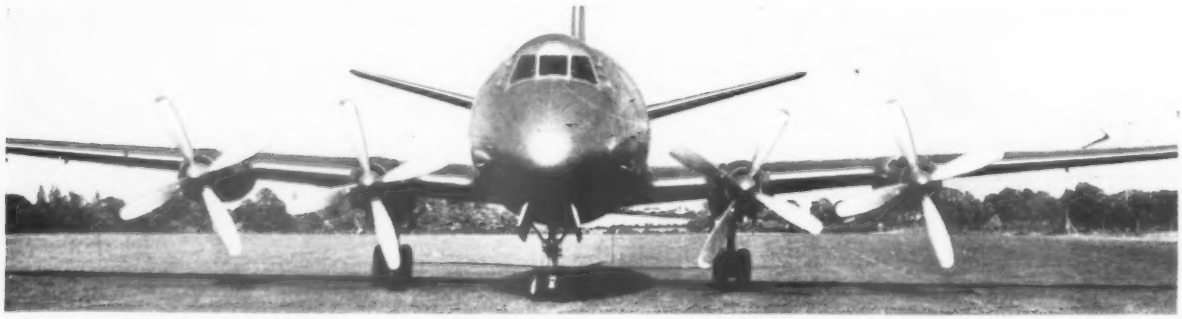


New Piper Clipper is lowest-priced four-place plane ever put on market in U.S. It has 115-h.p. Lycoming engine, cruises at 112 m.p.h. and has range of 480 miles. Standard equipment includes starter, generator. Rear seat has left-hand door. Price: $2,995.

HAVE YOU SEEN? *continued*

Helicopter rotor pattern is shown in striking photo of Navy craft equipped with lights on its rotor tips and fuselage.

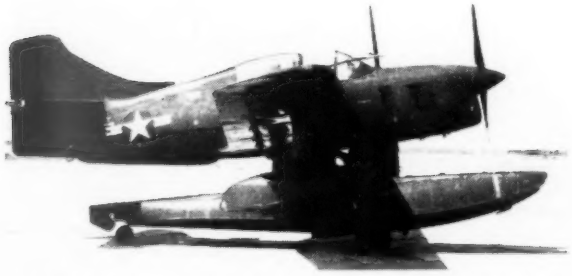
British Short Sealand is twin-engined amphibian which carries crew of two and eight passengers. Cruises at 174 m.p.h.



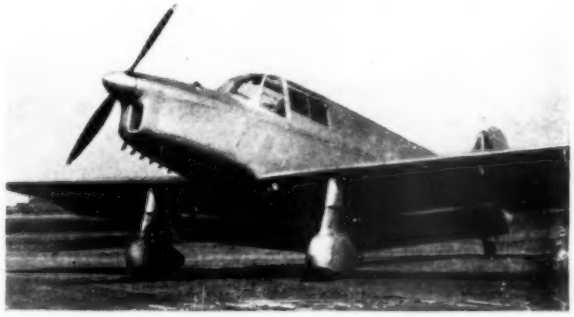
Vickers-Armstrong Viscount is first multi-engined plane powered by turbo-props. Rolls-Royce Dart turbines generate 1,500 h.p. plus 250 pounds of jet thrust. Viscount carries 32-43 passengers, has maximum speed of 381 m.p.h. at 30,000 feet, range of 1,550 miles.

Yak 14 is Russian four-place high-winged monoplane with five-cylinder radial M-11F engine. The plane is of mixed wood and steel tube construction with a fabric covering. It has a conventional strut-braced wing with double attachment, and fixed landing gear.

Douglas Skyrocket (D-558-2) is shown on JATO take-off in first flight photograph. Plane is powered with both turbo-jet and rocket engines, but JATO bottles used here are externally attached and have nothing to do with plane's internal rocket engines.



Edo XOSE-1 scout plane has new dorsal fin. This is last of the float-type scouts, which are being replaced by helicopters.

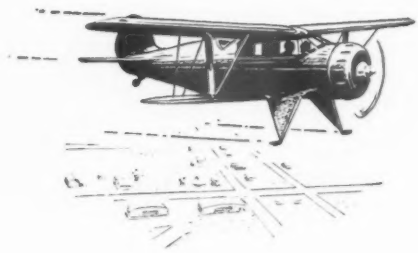


Youngman-Baynes plane is British high-lift research craft with full-span retractible slotted flaps and added auxiliary flaps.

Johnson Bullet 185 is all-metal four-placer designed by R. S. Johnson who built Johnson Rocket. Plane cruises at 185 m.p.h., has 800-mile range, stalls at 55 m.p.h. with flaps. Ram jet engine adds speed to take-off and cruise. Target price is $4,750.

I Learned About Flying From That! NO. 113

Author Jim Burnham (left) and Pilot Howard Dutton had several bad moments because they forgot to line-check their Waco.



What does a pilot think about when he finds that his plane has lost both of its wheels?

By

JIM BURNHAM

ONE FALL afternoon several years ago, Howard Dutton and I sat on the Administration Building porch at Simsbury Airport, Simsbury, Conn. We were watching some of the student pilots go through antics trying to make decent landings. Presently, another student pilot walked out of the clearance room intent on defying the law of gravity in a Piper *Cub*. He walked slowly around the plane, checking the control surfaces. As he walked by the wheels, he kicked each one violently.

"Why is it that half the pilots you watch usually kick the wheels before taking off?" I asked Dutton.

"Beats me," he answered. "I've noticed the same thing, but can't see that it amounts to anything."

Seven days later we had the answer. At that time of year, the ground freezes slightly during the night then thaws out during the day. Consequently the mud adheres to the wheels and fills the inside of the wheelpants on planes that have them. The next week, the lineboy removed the wheelpants from a UIC, 210-h.p. Continental four-place Waco, owned by the airport. During the process, he also removed the brackets which held the wheels and wheelpants on—but forgot to put them back.

About 3:30 p.m. that same day, the airport manager asked us if we would fly to Bristol, Conn., to bring a *Taylorcraft* back. Eager to make a fast dollar, we went out to the Waco, hopped in without line-checking it, and taxied out to the end of the east-west runway. Dutton checked the mags, headed into the wind, kicked open the throttle, and we were off.

Everything was routine—except for one slight incident. Unknown to us, both wheels dropped off the Waco the moment we were airborne. Fortunately, the airport manager was watching, noticed the wheels falling, and phoned Bristol to tell them of our predicament.

As we approached Bristol Airport, Dutton commented: "Must be an airshow or something going on down there, Jim. Look at all the cars around the airport." Circling the field, Dutton shouted, "There's a pretty stiff breeze. Think I'll go in crosswind on the long runway and make a hot wheel landing."

Circling wide, we started an airline approach when we noticed a man standing on the sod runway directly in our flight path. As we approached, we noticed he was holding an airplane wheel above his head. Dutton immediately pulled up and tossed the throw-over column to me. Then he rolled down the window on his side, stuck his head out, shrugged and said: "Jim, the wheel's gone!"

I grinned back and said with a laugh, "Guess we'll have to go back to Simsbury, make a one wheel landing and hope we don't tear up a lower panel."

I casually rolled down the window on my side, glanced out, and—saw nothing! There was the right landing gear, naked as a jay bird. I tried to be calm, and murmured sheepishly, "The wheel over here is missing too."

Dutton turned a dirty grey. I was three shades greyer. We both had visions of landing, flipping over on our back and having a 210-h.p. Continental engine in our laps.

We climbed slowly to 3,000 feet, both doing some heavy thinking. We had 80 gallons of gas aboard, no parachutes, and no wheels.

"Those sod runways at Bristol and Simsbury are out of the question," Dutton moaned. "We'd flop on our back on either of 'em. How about Brainard Field at Hartford?"

"Nope," I answered, "They're (*Continued on page* 65)

Cross-Wind landing wheels caster through 15° arc on either side, permitting ship to weathervane automatically into relative wind as wheels roll directly down the runway.

Now approved for DC-3's—The Goodyear *CROSS*-WIND Landing Wheel

No longer are DC-3's restricted to the use of multi-strip airports. Today, they can operate successfully in and out of *single-strip* fields, regardless of wind direction, thanks to the Goodyear Cross-Wind landing wheels. This amazing device, developed for the CAA by Goodyear engineers, is now approved for DC-3's. See what new fields of business the new Goodyear Cross-Wind landing wheels will open up for your fleet. Write for complete information, to:

Goodyear, Aviation Products Division,
Akron 16, Ohio or Los Angeles 54,
California.

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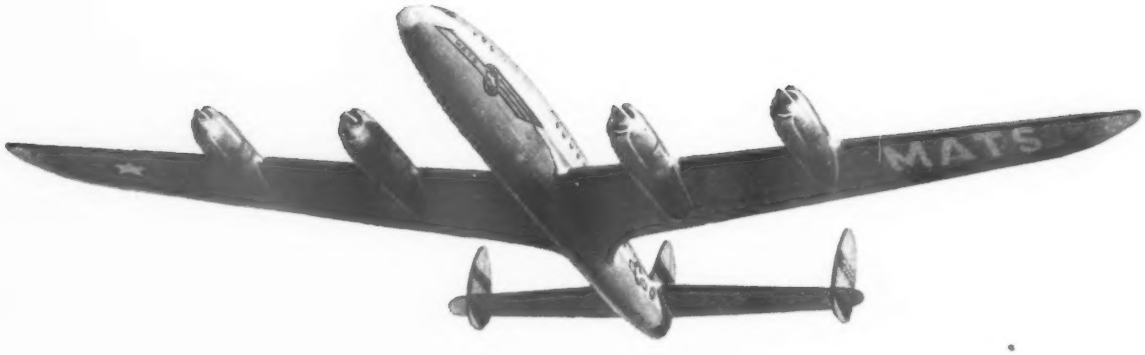

Meet the Lockheed C-121*

This is the U. S. Air Force version of the famous Lockheed Constellation. Tried and proven in 4,000 *million* passenger miles on the world's commercial air routes, the swift Constellation has been made available to the Military Air Transport Service (MATS) for the more important flying tasks of the all-important science of logistics.

LOOK TO LOCKHEED FOR LEADERSHIP

Lockheed Aircraft Corporation

Burbank, California

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THE LIBRARY

YOUNG PEOPLE'S BOOK OF JET PROPULSION, by Frank Ross, Jr. Published by Robert M. McBride & Co., 200 E. 37th St., New York 16, N. Y. 126 pages. Price $2.75.

This book is togged out well but that is all that can be said for it. Nine-tenths of the book merely lists jet planes, and about one-tenth is devoted to sophomoric writing, ornate cliches. Every now and then we find a new author making this mistake, that it is simple to write for young people.

The pictures are well done but they are the official releases of the military that most of us have been looking at for months and years.

The book was read by a group of young people, and one of them summed up their opinion. "The ideas are too simple and the words are too tough. Besides, it's old stuff."

This is a pity. We need a book that can live up to the title of this one.

—HY SHERIDAN

JET PROPULSION—TURBOJETS, by Volney C. Finch, Professor of Mechanical Engineering, Stanford University. Published by The National Press, Millbrae, Calif. 328 pages. Price $5.50.

There is no doubt that this work is thorough, learned, and seeded with new information. There is some doubt, though, that, as the author claims with charming modesty, it explains ". . . . jet propulsion . . . in a way that the layman can understand." Stanford must have a different class of student than they had at the University of California, or maybe it's the insidious influence of the New Look—at any rate, he does *me* too much credit.

On page 38 he has set down, right from the shoulder and without any footwork: "Entropy is an intangible but very useful thermodynamic property in the analysis of the jet engine. Like heat it has no definite value, and it is measured above an arbitrarily chosen datum. Its absolute value has no importance, but its change during a given process is usually of great interest . . ." There follow some ducky integrals.

If that makes your mouth water, this is your book.

—HY SHERIDAN

AIRPORT MANAGEMENT, by John H. Frederick, Ph.D. Published by Richard D. Irwin, Inc., 3201 S. Michigan Ave., Chicago, Ill. Price $4.00.

Dr. Frederick has written an unusually complete treatise on all phases of airport operation, management, maintenance and control. It should be must reading for planning commissions, councilmen and city officials who have something to say about the operation of their local airport. Private airport owners and managers as well will get a great deal of helpful advice from its pages. The author bases his information on the premise that all airports large or small, municipal or privately owned are faced with the same problems. I believe this is essentially correct.

Detailed data is given on the CAA's classification system of airports and the standards of adequacy for each. Various tables are introduced showing methods used in tailoring the airport to fit the needs and size of the community.

Special emphasis is placed on the proper planning of the buildings to be erected on airport property, so as to produce maximum revenue from concessionaires, of both aeronautical and non-aeronautical activities.

A full chapter is devoted to airport accounting and its problems. Another chapter dealing with airport insurance and liability gives several interesting case histories and the decision of the courts regarding airport responsibilities, whether municipal or private.

Among the other subjects covered are Airport Public Relations, Sales and Service, Aircraft Rentals and Shop Operations.

This book presents a digest of much of the knowledge essential to good airport management.

—CLIFF BANTEL, Manager
Bay Cities Airport
Los Angeles, Calif.

SHORT VIEWS

CIVIL AIR REGULATIONS FOR PILOTS, edited by Charles A. Zweng and Allan C. Zweng. Published by Pan-American Navigation Service, 12021 Ventura Blvd., North Hollywood, Calif. 47 pages. Price $1.00.

This booklet is a revised (to November 1, 1948) compilation of all Civil Air Regulations which apply to the piloting of aircraft in the United States. Recent changes in C.A.R. Part 43 (General Operation Rules) and Part 60 (Air Traffic Rules) are included. The Regulations are listed in numerical order and are indexed for easy reference.

PRIVATE PILOT EXAMINATION, by Charles A. Zweng. Published by Pan-American Navigation Service, 12021 Ventura Blvd., North Hollywood, Calif. 64 pages. $1.00.

Another newly-revised book put out by Mr. Zweng, this one is designed to prepare private pilot candidates for their written examinations.

The first two-thirds of the book is devoted to Civil Air Regulations which are applicable to the private pilot—Air Traffic Rules, General Operation Rules, and Pilot Certificates. The final third consists of 100 multiple-choice questions, with answers, on the Traffic and Operation Rules.

AOPA NEWS

Aircraft Owners and Pilots Association is a service organization for the private pilot or aircraft owner. AOPA's full time staff is devoted to helping the individual pilot. Its aim is: "To make flying more useful, less expensive, safer and more fun."

Headquarters are: 15th and New York Aves., Washington 5, D. C. Members also receive a special AOPA edition of FLYING, newsletters and confidential aviation data. Opinions expressed in this column are not necessarily those of FLYING MAGAZINE.

WEATHER COMPLAINTS

AOPA now is taking members' complaints about poor or inaccurate weather reporting or forecasting service directly to Weather Bureau officials responsible in Washington. They have asked pilots' cooperation in reporting all cases of unsatisfactory weather information, and have asked AOPA's cooperation in helping them pinpoint stations giving poor service. Previous AOPA complaints to Weather Bureau have been lodged on the basis that such unsatisfactory reports endanger pilots' lives.

DENVER'S TAXIS

Not long ago AOPA discovered that discriminatory taxicab rates were being charged private pilots traveling from Denver's municipal airport to the city. Airline passengers are charged a considerably lower rate.

AOPA took up the matter with Denver's city officials, insisting that private pilots should not be discriminated against by local taxi companies. Denver officials discovered that the existing ordinance, under which the cabs have been operating for some time, made it impossible to change. Result: a new ordinance is just now being put through, and equally low rates now will be charged private flyers.

CUTOFF VALVES

AOPA has just recommended to D. W. Rentzel, CAA Administrator, that immediate steps be taken to eliminate the regulation that requires all personal planes to be equipped with a fuel cutoff valve in the cockpit. AOPA took this action after receiving a detailed report on the causes of engine failures in personal planes during 1947 from Fred Weick (AOPA 9893), *Ercoupe* designer and head of personal-plane research at Texas A&M College.

Weick's report shows that the great majority of power plant failures in personal planes are due to failures of the fuel system, and he makes a strong recommendation that fuel cutoff valves be eliminated. In concurring with his findings, AOPA has sent a formal request to the CAA Administrator, asking that the regulations be altered so that these valves can be eliminated from personal-plane cockpits and a continual-flow fuel system be substituted.

Weick also recommends that present-day carburetor systems be abandoned, and fuel-injection be made standard equipment.

WINDS ALOFT

All Weather Bureau winds-aloft reports now are being given in knots instead of statute miles per hour. This "sleeper" change in the regulations went through January 1 and already is in effect. Main reason for the change is to conform to international regulations, to which the United States is committed. However, the adoption of knots is intended primarily for international use, not for domestic use within the continental United States. AOPA is recommending to its members making domestic flights that they request winds-aloft information in statute miles per hour, advising the reporting station that they are flying domestically not internationally.

REMOVE THE 'C'

A mandatory Civil Aeronautics Board order requires that the letter 'C' be eliminated from all United States aircraft by December 31, 1950. If this date is adhered to, some owners of personal planes will be required to do some expensive maintenance work by that date in order to get the letters removed from upper and lower wings, and rudders. AOPA has asked CAB to extend that deadline for those personal-plane owners whose planes may not be slated for maintenance by that date. CAB has said it will consider AOPA's request as soon as the deadline date gets close enough to determine whether the order will work a hardship on private pilots.

ARE YOU LIABLE?

AOPA now is completing a study of the "guest exclusion" laws of the various states, as they apply to personal planes. The wording of those laws determines whether a plane owner can be held liable for injuries to a person flying in that plane as a non-paying passenger. Highlights of the study will appear in the AOPA PILOT, and a detailed report may be issued separately at a later date.

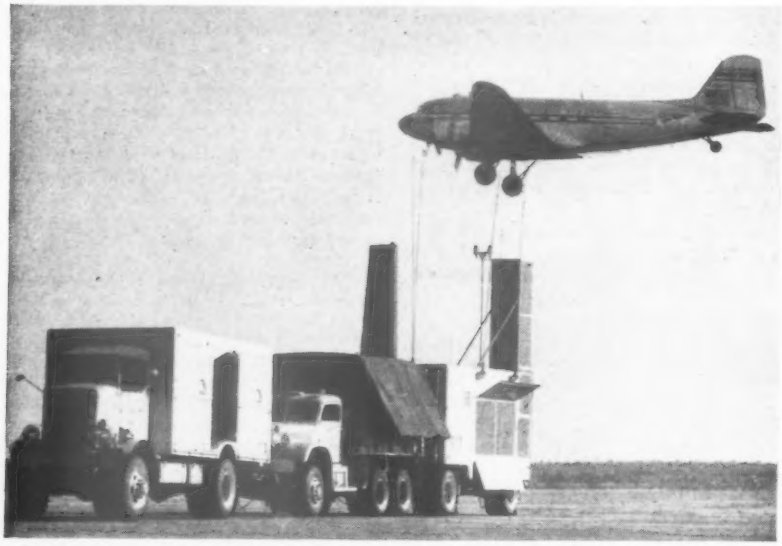
STALL-WARNERS

Stall-warning indicators are to be standard equipment on all four-place Piper aircraft, that company has announced. Instrument to be installed is the Safe-Flight Indicator (SFI), already widely used by AOPA members. It is this instrument that also is attracting so much attention in Air Force and Navy circles. AOPA members buying SFI instruments get a substantial discount. Meanwhile, after several years of personal-plane manufacturers' ignoring the device, and continual fighting by AOPA and CAA in an effort to get it adopted, it is expected that the majority of new personal planes will have the instrument as standard equipment by this spring.

GCA IS HERE!

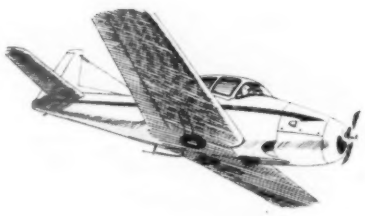
After several years of campaigning by AOPA and the armed forces in favor of it, and the CAA and airline interests against it, GCA has just been officially named a primary landing aid by CAA Administrator D. W. Rentzel. Prior to his announcement, GCA could only be used by civil flyers in an emergency; its official status was that of a monitor for the complex ILS (instrument landing system) installations favored by airline interests.

Despite the fact that CAA only has three GCA installations throughout the country, the Rentzel announcement marks a long step forward, as additional GCA installations now are scheduled for installation. END



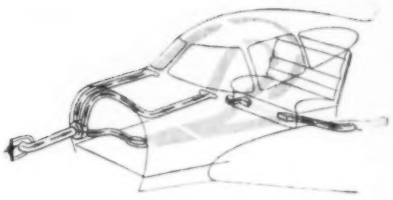
GCA unit at Floyd Bennett Field, N. Y., guides Pan-American World Airways DC-3 training plane to landing. Airline pilots can now use GCA as "primary landing aid." (See item.)

ONLY THE GREAT NEW NAVION FOR '49 GIVES YOU ALL THESE ADVANCEMENTS

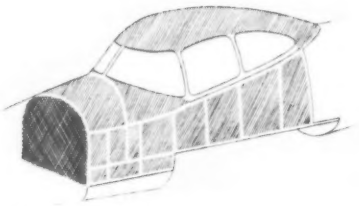


STILL HIGHER PERFORMANCE. New landing gear doors and fairings combine with more powerful 205 h.p. engine to deliver cruising speeds up to 155 m.p.h. Normal take-offs in 560-ft.; only 875-ft. needed to clear a 50-ft. obstacle, both on take-off and landing. New *Navion* climbs 900-ft., 1st minute, fully loaded.

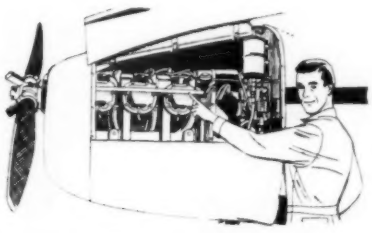
STILL MORE ROOM. Head and leg room to spare for four big people! Rear seat is 6-in. wider, and features new limousine-type folding center arm rest. Seat back tilts forward for easy in-flight access to luggage. With new optional *under seat* auxiliary tank, entire luggage compartment can be used.



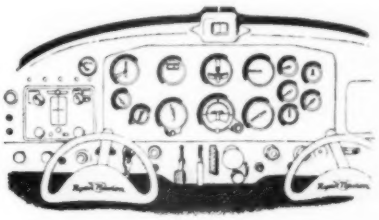
STILL GREATER COMFORT. New ventilating-heating system channels more fresh or warm air to every corner of the cabin. Softer, thicker foam rubber cushions, and high head rest in rear seat... tastefully upholstered in modern fabrics and trimmed with leather at wear points. Front seats adjust to individual requirements.



STILL QUIETER. A new, thicker blanket of insulation shuts out noise and heat. Engine exhaust is muffled and discharged under wing. Thicker Plexiglas windshields reduce noise, and new windows filter sunburn rays. Low noise level in *Ryan Navion* for '49 sets a new standard in restful flying comfort.



PROVEN MECHANICAL REFINEMENTS. Exclusive dual fuel system with independently operated engine-driven fuel pump and standby electric pump classes new *Navion* with *most modern* air liners for dependable fuel supply. New VHF radio is now standard equipment. Four new corrosion-proof enamel finishes.



IMPROVED CONTROL AND INSTRUMENT PANELS and more instruments... Manifold pressure, rate-of-climb indicator, outside temperature and dampened fuel gauges now included. Panel lights can be dimmed. Control knobs simulate mechanism they activate for positive identification. New key-ignition.

FLY THE NEW *NAVION* NOW! For demonstration, free business trip or colorful illustrated brochure giving you complete details on all 29 dramatic advancements in the new *Ryan Navion* for '49... See your *Navion* dealer or write Ryan Aeronautical Company, San Diego. There is no obligation.

NO OTHER PLANE COMBINES SO MANY FEATURES SO WELL

Ryan Navion

Rely on Ryan

RYAN AERONAUTICAL COMPANY, 104 LINDBERGH FIELD, SAN DIEGO 12, CALIFORNIA

LOGGING TIME

WITH HY SHERIDAN

Captain, American Airlines

FLYING DISKS. Here is a top secret that must be kept confidential. It is known only to the Soviet government, 10,000 Russian spies, the CIO unions, 4,000 enlisted men, their wives and their wives' friends, and a few officers. But it would not do for a taxpayer to be allowed this information.

A new supersonic plane, designed to be a service instead of an experimental plane, is shaped very much like a disk.

When flying disks were reported skittling over the country I was rather surprised because it seemed to me that the first persons to report seeing them could not know that the disk shape is the ideal shape for supersonic speeds.

* * *

Sadie the Stewardess says that the reason flyers tend to become expansive in what she calls the fundamental regions is that piloting is such a sedimentary occupation.

* * *

NOTE FOR THE RISING GENERATION

Don't forget, the thinner the air, the thicker the pilot.

* * *

One day Will Rogers was taking a trip, as he often did, on an airliner—a Ford as I recall it. The pilot was rushing around getting the details taken care of quickly because he did not want to delay his distinguished passenger. Will stopped him and said, "We're all headed for the grave, son. What's your hurry?"

All airplane pilots would fly a good deal longer if they hold onto that bit of wisdom.

* * *

THAT THIRD MAN. The flight engineer is in some of the cockpits already, on a training basis with most of the airlines concerned. Since such planes as the DC-6 were not planned for the third man, wherever you put him he is in the way, more or less, especially during that part of the flights when nothing whatever is doing.

But, naturally, he wants to prove his worth, so he has been known to reach for this device and for that control, and to make microscopic adjustments, during the process of which he gets his thumbs in the pilot's eyes, and so on, cozy as a subway.

One of the captains who had not yet inured himself to this new symptom of progress leaned over to the eager third man and said, "Tell you what we'll do, son: you do the worrying and I'll do the flying."

* * *

Well, the airlines are getting poor and the managers are getting rich. Sadie refers to the vice presidents as the Separate Maintenance Department.

* * *

WHAT'S COOKIN'?

The trouble with modern airplanes, especially the airliners, is that they burn up. The integral tanks, some experts have stated in print, contribute no little to this deplorable addiction. An integral tank, as you no doubt know, is where the wing itself is the tank, you get some gas tanks and shape them like wings and then hook the fuselage and engines on, and you have an airplane.

Some fires start when the wing seams are opened upon the collapse of a nose wheel or a side of the landing gear, and the engine usually seems to be the source of the ignition. According to the newspapers some fires start in the air and usually these are fires in the engine nacelles. Since the engines are, on these low-wing monoplanes, built into the wings, and the wing itself is the gasoline tank, even an engineer can see that this provides a delicate or tinder situation.

Of course the passenger-mile safety record of the airliners is very good indeed, and if the fire thing could be eliminated airplanes would be by far the safest form of transportation.

Suppose, I said to myself, suppose the new transports were built on the high wing style, and the engines suspended below the wings. When an engine caught fire in the air, why, you would simply drop it if you had to, although being away from the wing you could put it out in time. "Number four is on fire, Cappy," your first officer says. "Pull the chain, then," you call out.

If you had to make a forced landing you could drop the engines beforehand and then you could land much slower and without having to worry about burning up. Of course you would tend to be a little tail heavy, but such matters can be arranged for in the design. It's better to be a little tail heavy than to land looking like one of those devil-chasers our fathers used to set off among the girls' legs on the Fourth of July.

Jennies and the Bandits

(*Continued from page 39*)

during the days and the icy desert winds cut through them at night.

They had salvaged the plane's compass and used it to keep their general direction, avoiding roads and trails. At one time, completely exhausted, they both fell asleep outside the tiny Mexican village of Bustillos. When they awoke, Dargue spotted four U. S. Army vehicles moving toward them. Both of the aviators jumped up, waving their arms and yelling.

But the vehicles didn't see them, and turned off in another direction.

Dargue and Willis continued their march. Without water and food they grew progressively weaker, but kept moving primarily because they knew Pershing needed the photographs. They eventually reached the U. S. base at San Antonio, recuperated slightly, and headed for Pershing's headquarters at Namiquipa to deliver the photos.

The two half-dead flyers delivered the negatives, only to discover they had been so damaged in the crash that they were useless.

That didn't stop Dargue, however. On another occasion, he had an even more harrowing experience—but got out alive by using his wits.

General Pershing had an important dispatch for Marion H. Letcher, American consul at Chihuahua. The dispatches had to go through—and the First Aero Squadron volunteered to see that they were delivered. Captain Foulois, the unit's commander, decided to send two planes with duplicate messages. He and Lieutenant Dargue flew in one plane, and Lieut. J. E. Carberry and Capt. T. F. Dodd in the other.

According to prearranged plan, Dargue landed in a small field at the south side of the city, while Carberry landed at the north side. Foulois left the plane to deliver the dispatches and Dargue took off to join Carberry.

Just as he left the ground, a squad of Mexican soldiers started firing at him. Bullets whizzed by, but Dargue was uninjured. The plane was peppered, however. As he flew out of sight, Dargue saw the soldiers surround Foulois and arrest him. (Foulois was later released, after contacting the U. S. consul.)

Meanwhile, Dargue landed at the other side of town alongside Carberry's plane—and discovered that Captain Dodd had also gone into the city with his dispatches.

A crowd of soldiers and natives quickly gathered—and though the men weren't fluent at Spanish they could see the natives were antagonistic. The two pilots went into a huddle and decided to fly to a larger field near an American factory where they could obtain protection.

But by this time the hostile Mexicans were pushing around the plane, whacking off pieces of fabric for souvenirs, burning holes in the fuselage with cigarettes, and tampering with the rigging. The two officers found that the Mexicans had taken the pins from Carberry's elevators and rudder, so they repaired them with nails—and Carberry cranked up his engine, and took off. Surprisingly, the

"THERE'S CLEANING ACTION BUILT RIGHT INTO EVERY DROP OF ESSO AVIATION OIL—AND WITH GOOD OR POOR PERFORMANCE OF LIGHT PLANES DEPENDING SO MUCH ON WHETHER AN ENGINE'S CLEAN OR GUMMED UP—ESSO IS THE AVIATION OIL WE RECOMMEND FIRST AT THIS AIRPORT."
Richard C. Bonhurst, Airport Manager, Niagara Falls Municipal Airport, Niagara Falls, N. Y.
Member of N. Y. State Aviation Council, American Assoc. of Airport Executives
"FLYING IS SPORT TO ME ... BUT I DO WANT FUELS AND LUBRICANTS I CAN DEPEND ON. THAT'S WHY ESSO AVIATION PRODUCTS ARE MY FIRST CHOICE, TOO."
Marion Taylor, Private Flyer, Niagara Falls, N. Y.

DEVELOPED by America's largest, most modern aviation petroleum laboratories ... *proved* by ten years of actual flying ... Esso Aviation Oil comes in 3 grades for *all* flying conditions: HD 55, HD 65, HD 80. It is available at airports from Maine to Texas ... wherever you see the famous Esso Winged Oval.

YOU CAN DEPEND ON

Mexicans viewed his feat with happy surprise and cheered lustily as the plane left. Their good nature didn't last long, however. They turned back to Dargue, and ominous rumblings began again.

Dargue saw he was in a tight spot. As he looked the *Jenny* over, two Americans came up and told him the Mexicans were ready to stone him. They also said, frankly, that they couldn't help him. They had to live there. Dargue saw their point.

He finally got the engine started and taxied for take-off. Most of the Mexicans had stones in their hands by this time and were lobbing a few toward the plane. A well-placed shot in the propeller would have stopped the take-off—but the Mexicans seemed to prefer stoning the pilot. As the plane left the ground a fusillade of stones tore more than 50 holes in the wings and fuselage.

Dargue hardly had time to enjoy his respite. In about a minute, the turtleback on the fuselage tore off and whipped into the leading edge of the stabilizers, damaging them extensively and forcing a landing. As he climbed out of the *Jenny*, he found another group of Mexicans stomping on the turtleback. He chased them off—but his tormenters appeared to be gathering courage by the minute. Dargue was worried. He couldn't guard all the parts of the plane at once and it appeared that the finish was near.

Just then a Mexican photographer walked over to take some pictures. The crowd immediately became absorbed in the technique of photography—and seemed willing to do almost anything to assure its success.

Dargue took full advantage of the situation. For 30 minutes he kept the photographer on the verge of hysterics by moving just as the shutter was about to be snapped. He posed and re-posed, and the crowd forgot its ire.

Eventually a military guard, furnished by General Guiterrez, military governor of Chihuahua, arrived and Dargue set about repairing the damage to his plane. He managed to patch up the wrecked stabilizer with a rim from a wagon wheel and got off safely for the field where Carberry was waiting.

At another time Dargue was given the task of finding the independent command of Col. G. A. Dodd, 7th Cavalry. He took with him a confidential dispatch from General Pershing, some tobacco and some candy. The regiment had been out of communication with division headquarters for more than three weeks. Three attempts had already been made to locate it, and Dargue was not hopeful. He took off, however, and headed toward the area where Colonel Dodd had last been reported.

Two hours later he approached a range of mountains 10,000 feet high, crossed them at 10,300 feet. The *Jenny* barely made it. On the other side of the mountains he saw a column of American troops and prepared to land. He discovered then that the spring on his foot throttle had broken. The motor wouldn't throttle down, so he landed with the switch.

The column turned out to be a squadron of cavalry under Col. Robert L. Howze, who informed Dargue that he would probably find Colonel Dodd farther south. So once more he took off.

Eventually he came to a cluster of adobe houses at a place called Santa Isabella. As he circled above it, looking for signs of life, he saw an American soldier. Dargue landed.

The American turned out to be Lieutenant Nicholson from Colonel Dodd's command, with 39 sick men and 40 sick horses. With him was the only doctor in the regiment. He told the aviator that he would probably find the main column at a place called Providencia.

Dargue took off for Providencia where he found another cluster of adobe houses and saw several soldiers. He flew down nearer the ground and saw they were Mexicans. But he decided to land anyway. He had to have more information.

When the Mexicans came over to look at what was probably the first airplane they had ever seen, Dargue had immediate misgivings. They were armed with every conceivable sort of small weapon. Each had a belt full of cartridges and several bandoleers slung across both shoulders. They were a tough lot.

Dargue could speak halting Spanish, so to direct their interest he began explaining his plane, wiggling the controls so they could see them work. Finally he inquired if they had seen any Americans.

At this they became surly and threatening, so he explained some more about the plane and gradually led up to his question again. At last one of them replied that the Americans were "over that way," sweeping his arm through a 130° arc.

Dargue then had to think up some way of taking off without getting shot; for apparently the Mexicans had no intention of letting him get away. He asked if one of them wouldn't like to take a ride. They were enthusiastic. The only question was—who would get the honor?

Finally they settled it among themselves, chose one of the most ruffianly-looking. Dargue then explained that the plane had been giving him some trouble before he landed, so he'd better try it out first alone, because naturally he didn't want to hurt anyone. That was agreeable, so he took off. Needless to say, the bandit waited a long time for his ride.

After nearly an hour's flight, Dargue caught sight of a straggling Army mule. That meant that American troops could not be far away.

A mile farther, he caught up with the tail of the column. It turned out to be the 7th Cavalry, and he delivered General Pershing's message to Colonel Dodd.

"I don't know what was in the message," Dargue said later, "but I believe it was information that Villa's main body was at Guerrero, about 55 miles from Providencia. Colonel Dodd got the message at noon and at one o'clock started on a forced march which landed him at Guerrero early the next morning. There he met Villa and engaged him in a battle in which Villa was wounded."

Dargue delivered the tobacco and candy to Colonel Dodd's troops. They had been without food for days, living on what meager rations they could buy from the Mexicans.

This was war flying in the old days. During the following 12 months aviation warfare developed rapidly. In the World War then raging in Europe, designs were being improved, engines were being made lighter and more powerful, and airplane armament was being added.

By the time the U. S. entered the war, just one year after Captain Foulois and his pilots flew over Mexican deserts and mountains, war flying was a highly-developed science. And the First Aero Squadron, from its experience with the Punitive Expedition, had enabled its commander to predict the urgent U. S. need for planes, armament and engines. END

15 YEARS AGO

FROM the April, 1934, issue of this magazine:

Mrs. Franklin D. Roosevelt took a physical examination for a pilot's license but decided not to take flight instruction. Her reason: "Franklin thinks it would be foolish since we do not have a ship and we can't afford to buy one just now."

The Heyford Express Night Bomber, latest addition to the RAF, was powered with two Rolls-Royce 525-h.p. engines and had a maximum speed of 142 m.p.h. at 12,500 feet. This "British super-bomber," with a four-man crew (pilot and three gunners), could carry 2,800 pounds of bombs a distance of 510 miles in 4½ hours. Its 920-mile range was designed for "penetration into the enemy's center."

Orville Wright, asked what his sensations were on that first flight, replied: "I don't recall any sensation. I was so interested in whether the thing would work . . . I did not have time to think about it or gather any impressions."

A full-grown cat was provided by her Texas owner with a three-foot parachute and dropped out of a Curtiss *Robin*. However, prop wash pulled a wire out of the harness connection and the hapless cat had a 1,000-foot free fall. Surprisingly, the cat was not hurt although it was stunned for a few moments. Readers were assured the free fall ". . . was purely accidental as there was no intention of hurting the cat."

In Russia, an "aerial postoffice" was placed in service between Moscow and Kharkov. Letters were sorted in flight, pouched, and dropped at their destinations. The Soviet government hoped ". . . eventually to extend this service to the farthest reaches of its vast domain."

TWENTY YEARS AGO

A new record for transcontinental non-stop flights was established by Capt. Frank M. Hawks flying the single-engined Lockheed *Air Express*. Time: 18 hr., 21 min., 59 sec.

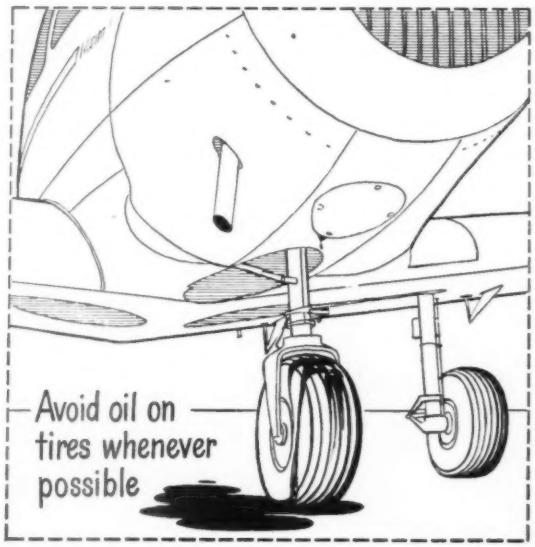
A page of service tips for private flyers and fixed-base operators

PLANE FAX

How Palo Alto Airport Eliminates Stuck Rings, Valves and Bearing Failures

J. P. Nystrom, Superintendent of Maintenance of Palo Alto Airport, Inc., tells how "RPM" helps cut down expensive overhauls. He reports that "since the first fiscal year, after switching to RPM Aviation Oil, we have flown approximately 13,000 hours with absolutely no stuck valves, rings or bearing failures."

Now, of course, Palo Alto Airport uses RPM Aviation Oil exclusively in its company-owned flight line ships. And Mr. Nystrom recommends "RPM" Oils to his customers because "it gives us a deep feeling of satisfaction to be able to use and recommend a product knowing that it will give the type of service to which the aviation public is entitled."



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How parking care extends tire life

If a wheel of your plane, when parked, is directly below the engine, it's a good idea to cover it to keep engine drippings off the tire. Some careful flyers have inexpensive tire covers made for this purpose. Protect your tires from damage by oil—and use Atlas Aircraft Tires for rugged, dependable service. For these famous tires have an extra "safety factor" and durability, thanks to special Atlas engineering which produced the best for military planes. Your Standard Airport Dealer can supply you with Atlas Aircraft Tires now.

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FLAT SPINS

THE OLD FLYING SUIT COMES HOME

•

BALLOONS AND GUNPLAY IN ITALY

•

ORVILLE WRIGHT AND WOMEN FLYERS

• ALLIGATORS AND MRS. HANDY

Mrs. Dora Keen Handy, 77, of West Hartford, Vt., has started alone on a 20,000-mile, three-month, round trip flight to the Belgian Congo. Mrs. Handy, who is not quite five feet tall, says she wants to see alligators, leopards, pygmies and mountains. She adds, "And I am looking for adventure."

• JUST MONKEYING AROUND

Throckmorton Percival Kauber Burton, APE 1st class, went AWOL from a U.S. Naval Station in the Philippines—and received an "undesirable" discharge. Arrested shortly afterward, his rank was restored by the Coast Guard with no black mark on his record. T. P. K. Burton took it all in stride. He is a gibbon ape, picked up by Navy flyers in Burma.

• THE WEAKER SEX

Miss Ruth Law, who piloted a plane over Washington, D. C., during a 1917 Liberty Loan drive, attended the recent Kitty Hawk ceremonies in Washington, and revealed that Orville Wright had refused to teach her to fly because he thought women would never be able to master a plane.

• ONE RUN, NO ERRORS

The pilot on a British airliner called Hostess Pauline Guthrie into the cockpit, informed her that the front compartment was on fire, the main exit door was jammed, and the destination was "zero-zero." Calm Miss Guthrie joked with passengers, gave no indication of the danger. When the plane landed in the fog, it broke into four pieces. But, with aplomb, Miss Guthrie guided all passengers to safety through a hole in the fuselage.

Then she blew up: the crash had caused a run in her nylons.

• HOME FOR CHRISTMAS

Charles F. Kettering, Research Consultant to General Motors, tells this long-forgotten aviation anecdote:

On December 17, 1903, Katherine Wright of Dayton, Ohio, received a telegram from her brothers in Kitty Hawk, N. C., which read: "MADE OUR FIRST SUCCESSFUL FLIGHT TODAY. WILL BE HOME FOR CHRISTMAS. WILBUR AND ORVILLE."

Miss Wright phoned the editor of the local newspaper and read the telegram to him. He replied, "Thank you very much, Miss Wright, for calling. We are glad to know the boys will be home for Christmas."

• FISH STORY

Francis Houle knows what fishermen mean when they talk about "the one that got away." Recently, an enthusiastic angler fishing near the Yonkers, N. Y., seaplane base cast his sinker right through one side of an anchored plane and out the other. It passed just under the nose of pilot Houle seated in the cockpit.

• AIR LIFT

The cost of maintaining the Berlin airlift is more than $400,000 a day for the Air Force alone.

• SMALL WORLD DEPARTMENT

Angus Bethune of Hobart, Tasmania, former RAAF flyer, went back to his farm after the war. One day he bought a war surplus flying suit to wear around the farm. And—yep—the first one they handed him was *his* old flying suit.

• WRONG KIND OF PLUG

Advertising can be dangerous in Italy. An advertising balloon staked to a Milan building was ripped open

one dark night by three revolver shots. The ad agency shrugged off the gunplay, blamed it on an "irate competitor."

—Harold Helfer

I Fell 2000 Feet

(*Continued from page 23*)

teered for paratroop service. It was the comparative inaction of the fallen-archers that did it, but Charlie says apologetically, "I wasn't tough enough for the infantry."

Overseas with the Allied Airborne Army, First Lieutenant Gabby got all the action he'd asked for—and then some more. A Silver Star, a Bronze Star, and the Purple Heart with two clusters are proof enough of just how busy a Combat Infantryman he was.

In France, land mine shrapnel peppered and pierced his ankle. In Italy, he took a bayonet in the back—was saved when his sergeant dropped the Kraut with a well-aimed bullet. In Germany, two days after his outfit had been ordered back in the Bulge, Gabby, who'd stayed behind to get in a few last licks, got a few himself. A German machine-gun burst put three shells through the upper part of his right leg.

After redeployment, Gabby wasted only a few months at other occupations before returning to his "high-jinks." He almost went into the restaurant business. He did a stretch M.C.-ing at a Pittsburgh night club. He and a friend bought four trucks and had a coal delivery service flourishing until strikes came along and left them holding the coal bag. But that, Gabby felt, was just as well. All this had been too much like peace and quiet. He checked out of Charleroi once more, winged west to Hollywood.

There being more action in B pictures than anywhere in the world, Gabby had no trouble securing employment. He did jumps that are now in the "catalogue" file for future films—into rivers and trees.

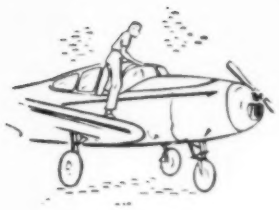
In appearances all over the country before and since Hollywood, Gabby made a lot of unorthodox jumps—rarely anything so simple as leaping from a plane and landing on the ground. Among them have been precision competitions aimed at landing in bullseyes from 10 to 50 feet in diameter—though, Gabby apologizes, "I've never done better than runner-up."

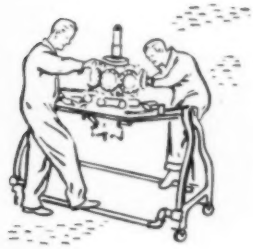
The water jump is his specialty. This is a leap in which, to prevent being smothered by his own chute, he must dive free from it at 10 to 15 feet above the water. Gabby has chuted from the dangerously low altitude of 500 feet into a 60x140 foot swimming pool. He's landed in the Monongahela River in shows for the home folks. He's splashed into lakes—and for a price would try it into a bathtub.

Land jumps have put Gabby in some strange spots. In one of his 184, Gabby almost electrocuted himself between high tension wires—but by dint of frenzied suspension line tugging, avoided falling inside them. The wires grabbed his chute though, and Gabby dangled like a pair of old overalls, until he released his buckles and fell the 20 odd feet to the ground.

Once he landed in the center of a highway—amazing and confounding motorists, and stopping traffic. In a water jump

HERE IS YOUR JOB in AVIATION





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TRAIN IN MIAMI -- AIR CAPITAL OF THE WORLD

at a Miami Air Show, he sprained an ankle. At the Cleveland National Show, he had a "malfunction"—first chute didn't open. But the second did and Gabby could breathe again—until as he approached the earth, the perverse first chute opened, too. Frenzied shroud-shredding prevented their fouling, and a fatal fall.

High point, in point of altitude, in Gabby's career, was a delayed jump in which he fell from 6,500 feet and didn't open the chute until 1,000.

Stand atop the average 100-foot apartment house, or even a 20-foot diving board, and look down. You get an idea of what even *thinking* of a sky-high jump is like. And 2,000 feet is almost half a mile. It's seven football fields, twice the Eiffel Tower plus many bakers' dozen of foot-long French breads. In any country, in any language, it's a long way to fall with a dead parachute.

The people of America thought so. The mails brought four marriage proposals to Gabby—including one from a girl who said she could go for a man who'd fall that hard for a woman—or for money.

The town's summer theatre—the Monticello Playhouse—sponsored a Sunday night benefit performance, ticket sales of which netted more than $200.

Tales they're still telling at the hospital include the fact that the first day, asked his occupation by the receiving nurse, he answered, "parachutist," and then added dryly, "I mean—ex-parachutist."

At the same time, though pains echoed through his body, he refused pain-dulling opiates with the protest, "Hey, you'll make a hophead out of me." He immediately offered to teach his nurse, Kay Lemon, parachute jumping.

Gabby definitely intends to jump again. He's booking engagements right now. First question he asked at the hospital was, "Will this take long? I'm booked solid for the next two months."

When a famed cigarette intermediary approached, Gabby had a good line ready for him. Said he, "I guess you could say that 'I'd jump a mile for a Camel.'" Another line he's proud of is the title he suggested for this story: "Good to the Last Drop."

Gabby traded jokes with all comers. Answering a friend who took a look at his left leg and urged him to "keep a stiff upper leg," he said, "You know, I've always wanted to be in show business—and I had to do this to get in the cast." He asked the doctor if he'd be able to play the piano when his arm healed, and when the doc said yes, quick-quipped, "That's strange—I couldn't play before I broke it."

Gabby, who once edited a VFW newspaper and has always wanted to be a writer, by coincidence was planning to send the following anecdote into a national magazine's true-life-experience section. He was prevented from mailing it by his latest accident. Something that actually happened to him, it went like this:

"The stunt parachutist's publicity man, photos of his umbrella-man in hand, argued with the editor of a small-town newspaper.

"Yes," said the editor firmly. "I know it's publicity for our County Fair—but I can't have a picture on everyone. Isn't it enough that we're using a story on your man?" Finally, apparently worn down, the editor reached for the photo and jotted "Engrave this" on a memo which he clipped to it. "Ah," said the press agent, pleased at his victory, "so you'll use it?" "No, it's not news enough right at the moment," replied the editor. "But if that chute doesn't open . . ."

Gabby's girl-friend almost deserted him when she visited the hospital and attempted to lay down the safety laws. "Either give up jumping," she said, "or give me up." "O.K.," said Gabby. "Goodbye." But she, realizing that she couldn't change Gabby, decided to stick with him.

Gabby is still making plans. No one has ever survived a leap from Frisco's Golden Gate Bridge. Gabby figures he might like to try that some time. Then he's an inventor—has worked on a water pick-up apparatus to aid air-sea rescues.

He may start a Flying Circus, too. Enough money can be made in single and double jumps to buy equipment for that. It will feature aerial acrobatics on a trapeze, and possibly a Bat Man act. There'll be land pick-ups, and the first "triple jump" in aviation history—a gravity and grave defying leap which Gabby plans to do himself.

Gabby, who claims that he doesn't sleep well some nights worrying that some chutist will survive a 3,000 foot free fall—thus beating his hard-earned record—has big plans for that triple jump. He's in contact with a big beer company—hopes to do his triple under its sponsorship—with his three open chutes representing its three rings of "Body," "Purity" and "Flavor."

Retirement? That's planned for the tender age of 30. It would have been sooner, Gabby complains, if this accident hadn't killed all those bookings last year. But when retirement comes three years from now, it'll be pleasant, indeed. To what sort of occupation will he switch?

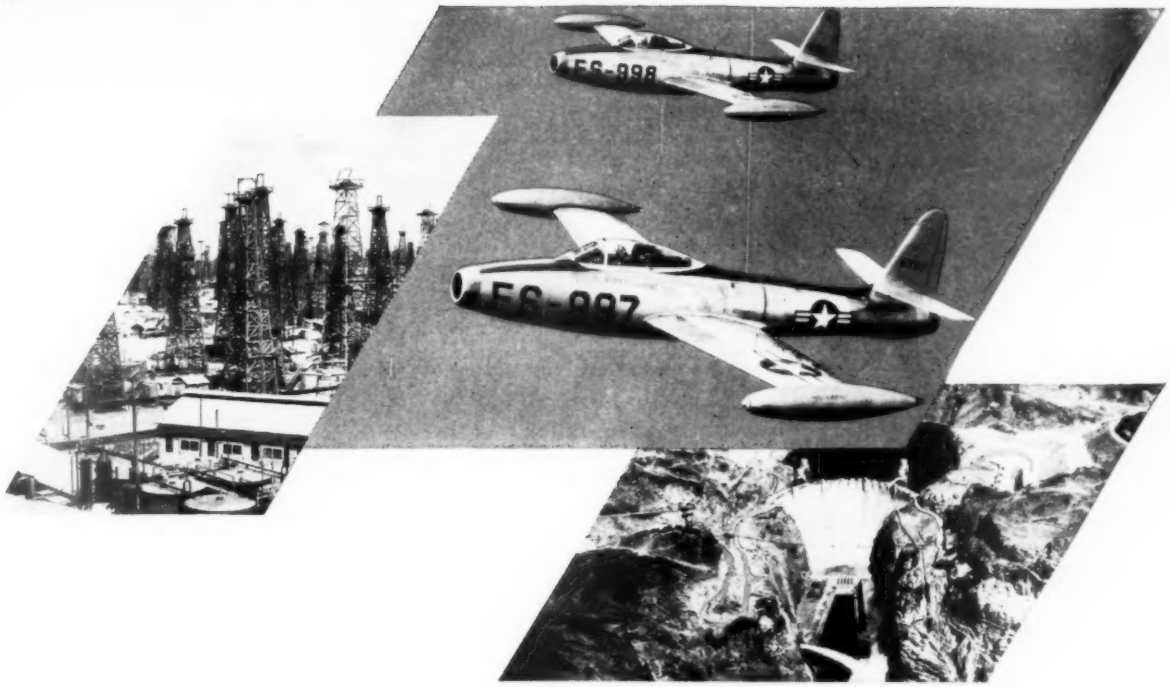
"Well," says Garbutt, "to something tame—like training lions." END

SOVIET FREAK

THIS odd looking airplane is a Russian reconnaissance and training plane believed to be in mass production in the Soviet Union. It is the *MIG* (named after its designers *MI*koyan and *G*urevich) *Utka* or "Duck." The *MIG Utka* is a three-seater powered by a single M-77 150-h.p. engine.

The queer Soviet plane is a canard-type pusher. The horizontal stabilizer is at the front of the long scoop-shaped nose—which probably gave the plane its name of "Duck." Twin vertical stabilizers, however, are attached at mid-point on the trailing edge of the wing, and seem to be anchored in part by one of the two struts which brace the high wing. The wing itself is swept back. Gear is tricycle and non-retractable. There appear to be leading edge slats or slots near the wing tips which are shown on the silhouette at right but which are not discernible on the accompanying photograph.

Forward visibility with this type seems to be superb, and side vision is good. There is a skylight for limited overhead vision, but the *Utka* appears to be absolutely blind from the rear, with the engine obstructing all possibility of rearward vision.



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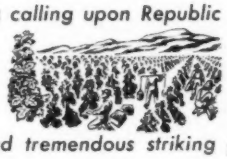
man-made miracle of irrigation's wonders, all are assured protection. ¶ This vital area of the West is patrolled by the Air Defense Command of the U.S. Air Force . . . which is calling upon Republic F-84 Thunderjets in ever increasing numbers to assist in



carrying out the air defense mission. The Thunderjet's broad range . . . speed of more than 600 M.P.H. and tremendous striking power, are day by day proving to be necessary defense factors . . . for preserving the peace.

Republic Aviation Corporation, Farmingdale, L. I., N. Y.

"This is the year of the Thunderjet"

REPUBLIC AVIATION

Makers of the Mighty Thunderbolt • Thunderjet • XR-12 • XF-91

Swept-Wing Monsters

(*Continued from page 25*)

Dessau, stripped it of all tools, dies, jigs, etc., and transported the engineers and other personnel to Russia. It is also known that Russia captured the several Ju-287 prototypes which had been built. Rumors seeping through the Iron Curtain indicate that they are building more.

A comparison of the basic features of the Ju-287 and B-47 is a lesson on the effect of wing sweep on basic design. Presumably Junkers selected the forward wing sweep to improve stalling characteristics, obtain a clear unobstructed bomb bay compartment directly on the c.g. of the airplane, and to use a conventional tricycle landing gear with the main gear attached to the thickest part of the wing. A detailed comparison follows:

	Ju-287	B-47
Wing Sweep.....	Forward (20°)	To the Rear (35°)
Vertical Location of Wing	Low-Wing	High-Wing
Wing Dihedral (Wing Droop)	Up	Down
Planform Taper....	Sharp	Blunt
Wing Anti-Stall Slots	At Wing Root	At Wing Tip
Jet Engine Location	Well Back on Wing	Forward of Wing
Landing-Gear	Tricycle	Bicycle
Location of Bomb Bays	Ahead of Wings	Rear of Wings
Fuselage Take-Off Rockets	Ahead of Wings	Rear of Wings

With a few basic aerodynamic facts at hand, we can almost read the minds of the designers as they worked out their basic arrangements. First of all, wing sweep is the same as wing dihedral when it comes to lateral stability. Sweepback amounts to positive dihedral and forward sweep to negative dihedral. Consequently, in order to have only the desired amount of positive dihedral angle—the sweptback B-47 has drooping wings while the Junkers wings point sharply up at an abnormal angle.

This immediately brings about a sharp point of contrast. The wing droop on the 47 was apparently enough to dictate that the design be a high wing—otherwise, the wing tips would drag on the ground. The Junkers, on the other hand, went in for a low-wing arrangement with the wing attached low on the fuselage.

The details of the wing planforms are different too. Since swept-forward wings first stall inboard near the fuselage this effect was apparently so pronounced on the Junkers that movable anti-stall slots had to be installed at the wing roots.

The sweepback on the 47 requires slots at the wing tips—which stall first on such wings. Since tip stalling isn't a problem on the swept-forward Junkers, then the tip chord could be reduced and the wings sharply tapered—which not only is stiff structurally but is also lighter. On the other hand, the 47 wing has rather broad tips with the opposite structural characteristics.

The direction of wing sweep also had a direct effect on the type of landing gear used. On the 47, since the main wheels on a tricycle gear are behind the c.g., and since the c.g. for a sweptback design is well aft on the inboard wing chord, a tricycle gear would be difficult since it would have to be attached to the wing trailing-edge—structurally awkward with retraction almost impossible. (The F-86 main wheels retract into the fuselage with the struts paralleling the flap spar). Consequently, the 47 has a bicycle type landing gear with the main wheels attached and retracted into the fuselage. Junkers, on the other hand, used a conventional tricycle gear with the main wheels attached to the main wing spar since the c.g. with sweptforward wings is far forward on the inboard wing chord.

The desirability of locating the bomb bays near the airplane c.g. resulted in the bays on the 47 being aft of the wing spars as they pass through the fuselage. On the Junkers, however, the bomb bays are entirely ahead of the wing spars—in a clear, unobstructed fuselage section. Location of the jet engines and the JATO units follow along in each case with consideration to longitudinal balance, and aero-elastic effects—bending and twist of the wings. Consequently, the location of the jet engines are reversed, being ahead of the wing for the sweptback 47 and to the rear of the wing for the swept-forward Junkers.

All of this would seem to indicate that the swept-forward arrangement is superior. Not necessarily so, however, for things are rarely what they seem—especially in airplane design. The Junkers design represents the first thoughts on swept wings—back when the idea itself was new and little was known of the more involved ramifications. In fact, the Junkers was originally built simply to try out the idea of forward-sweep and so the tail was conventional while the landing-gear on the prototype was of the fixed type.

It is now believed, however, that the peculiar structural characteristics of swept-forward wings and their behaviour under certain aerodynamic loads and the effect of masses within the wing create more problems than does sweepback. Also, the lateral stability of such a plane tends to decrease rapidly with Mach number. However, some engineers are strong advocates of this unusual shape and we may see more of them built in the future. In fact, at the end of the recent war, the Air Forces had the tail-less Cornelius fuel glider with swept-forward wings and Consolidated had a tail-less jet fighter on the drawing boards with this odd shape.

Actual performance of these two planes is interesting. The Ju-287 had a span of only 64 feet, compared with 116 feet for the Boeing B-47, and was only 58 feet long compared with 108 feet. It had a gross weight of 50,100 pounds, compared with 124,000 pounds and an estimated performance of 515 m.p.h. as against a reported 630 m.p.h. for B-47. The Ju-287 cruised at 465 m.p.h., landed at 106 m.p.h. and had a range of approximately 1,000 miles with 8,800-pound bomb load. These figures are estimates since actual performance data is not available to us. However, one proposed version of the Ju-287, with six jets instead of four, undoubtedly would have higher maximum and cruising speeds. The Heinkel-Hirth jet units had only 2,860 pounds static thrust and any considerable increase in their power would increase the bomber's performance substantially.

If the Russians are indeed producing this airplane with the German plans, technicians and factory equipment which they seized, they undoubtedly are using jet engines of higher thrust than the He-S 011, and the airplane's performance can be expected to have increased accordingly.

END

FLYING

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Get on the Beam

(*Continued from page 34*)

"Too many false signals from thunderstorms and snow," he explained.

All his previous cross-country experience had been via the iron compass or by pilotage and dead reckoning. Now, flying faster ships with complete radio equipment, he still stuck to the only method he knew. They flew high when the weather permitted and the visibility was good. When the ceiling or visibility was poor, they went down on the treetops with eyes straining through haze and smoke, trying to read signs on water towers, garage roofs, and even railroad station shingles. My friend Andy was nervous and worried. I spoke in his behalf, but it did no good—ignorance can be a tough opponent. They had always delivered their ships before. Why change navigation systems now?

Fortunately, most pilots do not feel this way about radio navigation. Those who do not fly by radio simply haven't bought a receiver because of limited funds. Or, perhaps some of them have a receiver but could use some additional instruction on its use.

Before venturing forth on any cross country flight by radio, a pilot should make certain his equipment includes earphones, spare batteries, maps, and a watch or clock. Some radio range data book is also required. The beam courses drawn on maps can't be relied upon. Radio range legs are constantly being swung in one direction or another to coincide with such things as civil airways, and only the latest available radio range information should be used.

The Superintendent of Documents at the Government Printing Office in Washington can supply you with a Flight Information Manual for $1. This book is reprinted twice yearly, in February and August. An Airman's Guide lists radio range corrections along with airport data and can also be obtained from the Government Printing Office. Some private companies print individual radio range sheets and compile them into a book for commercial airline use. These books are good, but would prove too expensive for the average private pilot who finds it necessary to fly only an occasional cross country trip.

The earphones are necessary because motor noise in most planes is too loud to allow loudspeaker reception. In some planes today, soundproofing has been sufficiently improved to allow speaker use, but earphones still prove most satisfactory.

Spare batteries should be carried, especially if the portable is the only receiver aboard. Battery life can be prolonged by using the receiver only intermittently. Between radio checks, the pilot can practice flying by maps, compass, and pilotage. In hazy weather or with poor visibility of any type, the receiver should be left on constantly. With good visibility and frequent check points, intermittent operation is usually all that is needed.

A map is still very handy for a double check on radio navigation. The pilot flying by radio alone would indeed be lost if his receiver suddenly went dead.

A watch or clock will not only help to figure groundspeed, but will allow estimates of arrival times over the next check point and destination. Without it a pilot would not know when to listen for scheduled weather broadcasts.

Once your new beam receiver is installed, you should be able to stay out of the wandering brigade of "land and ask" pilots permanently.

Knowledge of radio range construction and signal emission is helpful to the cross country pilot. Radio range stations are either the vertical Adcock or loop types. The chief advantage of the Adcock station over the loop installation is the ability to transmit range and voice simultaneously, while the loop station must shut down the range in order to transmit voice. Voice and range signals are sent out 1.020 kilocycles or 1020 cycles apart. This means simply that by retuning the receiver carefully, it is possible to have either the range or voice signals predominate. A voice range filter will accomplish the same job a little more efficiently. A series of dots overriding the range signals is the pilot's cue to listen for a voice broadcast to follow.

The vertical Adcock station gets that name from its five vertical antenna masts. The four outside poles transmit the letters A or N and the center tower takes care of weather and traffic information and various other voice broadcasts.

BRAKE PADS

PRIVATE pilot Dave Ohman of San Francisco believes he has solved the problem of heel brakes which many pilots find are difficult to use.

Ohman purchased a pair of rubber clutch and brake pads normally used on a Chevrolet automobile and cut them down to the right size. Then he drilled a 3/4 in. hole into the sturdiest part of the pedals, slipped the rubber pads on and secured them with one-inch metal screws.

Ohman says the pads eliminate the danger of heels slipping from the pedals at a critical moment.

All radio ranges have four legs or on courses, and the area between two legs is known as a quadrant. The space directly over a station sends out no signal at all and is known as the cone of silence. Some radio range stations have high frequency Z and fan makers located at the cone of silence and out on a leg respectively.

Without special equipment, however, Z and fan markers are not audible or visible. In the United States, the quadrant having a bearing of true north from the station is identified with the letter N. If a leg happens to fall on the true north bearing the adjacent quadrant to the west becomes the N quadrant. There are two A and two N quadrants, opposite each other. Similar quadrants are never adjacent to each other in a low frequency range station.

In Morse code the letter N is dash-dot and the letter A is dot-dash. The automatic keying at a radio range station is so controlled that the dashes and dots of these two letters are transmitted, one symbol immediately following another. This means that at an equal distance between two poles of an Adcock station, one long dash will be heard. This is the on course or leg of a range station. If it is necessary to swing the leg of a radio range, it can easily be done by increasing the power at one of the corner poles.

Prior to World War II, the CAA gave a course labeled "Cross Country" to advanced C.P.T. students. It was not a lesson in instrument or weather flying, but simply taught cross country navigation by radio. I remember one student who took this course and successfully completed all of it except for his check ride. His problem was to fly from Wilmington, Del., to the Philadelphia airport and return. He did a fine job of bracketing the beam, tying down a leg and identifying the range station at Philadelphia. There was just one thing wrong with his problem. The range he had bracketed had been Newark, not Philadelphia, and he found himself 80 miles away from station P.G.

All radio ranges transmit an identifying signal at 30-second intervals. That student had been so pre-occupied with flying a good test that he just forgot to check the identifying P.G. of the Philadelphia range. Never rely on the tuning dial of your receiver alone for checking the station you want. The identifying letters in Morse Code are the only sure sign that you are listening to the right station.

To familiarize yourself with radio signals, gas up your ship and fly over to the nearest radio range station. Check your map and see that it is a recent issue. Next, make sure that the range leg headings (magnetic) towards the station agree with the headings listed in your Flight Information Manual.

Your map will allow you to fly down a leg directly to the station by watching the terrain below, and following the on course beam in your earphones at the same time. Note how the volume builds up in the earphones as your plane approaches the station. This is as natural as the signals in your car radio that come booming in when you pass the antenna

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towers of a local broadcast station. Remember this lesson when flying cross country. If the volume increases you are flying toward the station. The volume will decrease and fade if the station is in back of you.

When flying along the on course, stay a little to the right of the leg. This allows on-coming traffic to pass to your left in accordance with C.A.R. If you hear a strong off-course A or N quadrant signal, make only a slight correction (not over 10°) to carry you back to the leg. A greater correction would cause your plane to intersect the leg at too great an angle and would quickly carry you through the on-course signal and into the opposite quadrant.

This is easily visualized if we think back again to cross country navigation by check points. The course line drawn on our map shows our correct path to be just to the left of a town. We are slightly off course to the right and pass over the center of the town. A slight altering of course to the left will quickly bring us back to the desired track and when we reach the original navigating line we ease off on that correction and continue on course. The correct beam bracketing procedure is exactly this. Apply a 10° correction, then take off half that correction when the beam is intersected. Close to the station, where the beam is extremely narrow, turns should be reduced to 5°.

Try flying directly over the station, in the space between the towers. Notice how the signal builds to a great intensity, goes dead, returns to great intensity, and then tapers off again.

Fly back and forth, passing over the station several times until you have a clear image of signal behavior at the cone of silence. Occasionally, false cones can be heard, especially in mountainous country. Always remember to check for a reversal of quadrant signals after you pass the station. If an N was on your right, approaching the station, an A will be there after you pass a real cone of silence. Sometimes in mountainous terrain, false or "dog" legs will parallel a range on course. A real leg has an A quadrant on one side and an N on the other. False or dog legs have the same quadrant letter on both sides.

Now fly around the range station using a radius of about one quarter mile. Notice the changing signals as you pass from the steady tone of the on-course to the bi-signal zone where the steady tone is mingled with the A or N quadrant signal. As you leave the bi-signal the lone, harsh, letter of the open quadrant will be audible with no sign of the on-course background audible. Then, go back into the bi-signal zone and through another leg until you have flown completely around the station.

You have a good picture, now, of the signals a range station emits. When you hear the series of high pitched dots signifying a voice message, retune your receiver slightly and bring in first the voice, then the range signals to the foreground. When you can hold a leg fairly well and recognize the station as it passes beneath the belly of your ship, you are ready for your first cross country flight using radio navigation.

Unless the visibility is very good, or you are over familiar territory, try to stick to the airways. This will provide you with a constant lateral check. The A's and N's of the ranges you fly will keep you truly on course. Wind drift left or right will be immediately apparent by the correction, if any, necessary to hold a leg. For ground speed checks, use the range station, an intersection of two radio range legs (tune to both stations alternately as you near the fix) and your map for cities, rivers, railroads, and any other point that falls on your course.

Now you are navigating by radio and are checking the weather as you fly. Paste a copy of this radio check list in your cockpit and refer to it while flying cross country:

RADIO CHECK LIST

1. Am I listening to the correct station? (What are the identifying letters?)
2. Is the station before or behind me? (Is the volume building or fading?)
3. What was the time over my last fix?
4. At what time do I estimate my next check point?
5. How is the weather ahead?
6. The radio can fail—I'll follow my progress on a map.

The radio receiver has brought you safely to your destination and you circle the airport counter-clockwise. Tuning to 278 kilocycles (check the tower frequency) you hear your landing instructions. You wag the wings to show that you hear, land and taxi to the flight line, kicking the rudder when on the ground to acknowledge tower instructions.

You cut the engine and your toes reach for the ground. You can't get over how easy this cross country flight has been. There have been no off airport landings to inquire the way. You saved plenty of gas by staying on course. That radio is cheap insurance. You start to walk to the airport coffee shop, but stop abruptly —you don't know which way to turn. Nope, sorry pilot, they don't have a beam like that! END

ROADABLE ERCOUPE

STARTLED Miami residents couldn't believe their eyes a few months ago. An *Ercoupe*, on its way to the Air Maneuvers, was doing an unhurried 30 m.p.h.—on the highway.

The "Roadable *Ercoupe*" is the brain-child of Wismer Holland, Valdosta, Ga.

Its wings can be readied for flight or detached and stowed on top by two persons in 30 minutes. The wings attach to the center section by two bolts on each side—at the landing gear strut and the rear spar.

At present, the propeller is used for motive power on the ground, but a separate hydraulic drive to the landing gear is being considered.

Maximum length of any single ground trip in the roadable so far has been only 27 minutes, but designer Holland expects no ground cooling problems. With the engine operating steadily at 850 r.p.m., producing ground speeds to 35 m.p.h., the oil temperature has never exceeded 150°.

Investigating the legality of operating such a vehicle on the highways, Holland found that Pennsylvania was not enthusiastic about it, but Florida and several other states had no objections. "As far as the CAA is concerned," Holland says, "it's just another *Ercoupe* and requires no elaborate procedure for approval."

Still to be discovered: the roadable's characteristics in a crosswind with wings stowed.

Still to be devised: a continuous circular guard for the propeller.

Still to be studied: highway rules that might restrict road operation.

When these steps are behind him, Holland plans to market "Roadable *Ercoupe*" kits.

I Learned About . . .

(*Continued from page 46*)

repairing some of the runways there—and I think the east-west strip is one of them. How about Bradley Field?"

"And spend three weeks clearing up the red tape?" Dutton replied. "Don't forget it's still an Army Air Base."

We finally settled on Barnes Airport at nearby Westfield, Mass. It had a CAA office, and we figured a lot of time and red tape could be saved if we cracked up with CAA inspectors as witnesses.

By this time, we were back over Simsbury, so we wrote a short note saying we'd try to land at Barnes and asking them to notify the CAA at that field so they could take the necessary precautions. Using half of one of the side windows as a paperweight, we dropped the note and proceeded to Westfield.

When Barnes Airport came into view, we could see crowds down below—everybody on hand to see us scatter the Waco and ourselves over the terrain.

Circling at 2,500 feet, we decided to dump the gas and toss out everything that could fly around the cockpit when we hit the ground. We opened the gas dump valve but noticed that the gauges underneath the top wings weren't going down at all. The end of the drain pipe came out of the bottom of the fuselage at right angles to the wind, and the wind held the gas back.

So once again we rolled down the windows and Dutton held my feet while I reached out and broke off both gas gauges. Then we tossed everything including ear-phones, mike, and a radio that wouldn't work.

Suddenly Dutton asked: "Don't you think you ought to crawl back in the fuselage to give me more weight in the tail?" It sounded like a good idea, so I unzipped the large opening behind the baggage compartment and looked back into the tail. At that moment the tubing looked about as strong as cellophane, and I decided that the landing attempt would be made without me as tail ballast.

We cruised just above stalling speed for about an hour, until the fuel was gone. Then the engine sputtered, coughed, blurrrped, and quit. Dutton kept kicking the starter to get the prop into a crosswise position so we wouldn't damage it. Working his way to the downwind end of the runway, he started his final approach in a very slow glide, just above stalling speed. We had about an 18 to 20 m.p.h headwind, which helped considerably. I crawled into the back seat to give him added weight.

We had a long glide, hitting the runway just in front of the hangar. And then it started. We tore into the runway, skidded along with a screech about 75 or 100 feet. Then the tail started into the air, rising higher and higher. But it didn't go over. The tail settled to earth, amid a rain of sparks from the landing gear.

We crawled quietly out of the plane, as the crowds surged toward us. They asked a million questions. One of *our* questions had already been answered. We knew why *pilots kick the wheels of their planes before taking-off.* END

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Decision by Air

(*Continued from page 37*)

attacks of larger scale and importance.

A much better example of the use of modern weapons, including the atomic bomb, is the fall of the Japanese empire. It is probable that the immediate cause of the surrender was the threat of destruction of all her great cities by the atomic bomb. Certainly it was not just the damage to Hiroshima and Nagasaki. Much greater damage to her war potential had already been done by conventional bombs.

By that time, too, her own air force had been shot down, her fleet sunk and her sources of raw materials cut off. She was faced, at best, with slow strangulation and continued pounding.

In addition to all this, there was a great joint task force poised in the western Pacific to invade her home islands. This task force had advanced slowly and laboriously from one base to another, a constantly increasing threat to every living Japanese. Its chief offensive weapon was the aerial bomb but its bases had been secured largely by the bayonet.

For this reason, there is a tendency among doughboys, including the airborne, to insist that the final weapon, in every case, must still be cold steel. From this they conclude that, to win a decisive victory, we must land great surface armies to slug it out in individual combat.

There are two phases of combat in which air-transported infantry may be indispensable. The first is the initial phase, when it is necessary to seize or reinforce bases for strategic bombing attacks. This requires an airborne force of moderate size in being at the outbreak of war, prepared to go into action immediately.

The other phase in which airborne troops will certainly be used is the final occupation of the enemy country. As in Japan, it will be necessary to make a sudden and decisive seizure of strategic areas to insure the total collapse of resistance.

Between these two phases comes the bulk of the fighting, and it is generally agreed that the object of this fighting is to overcome the enemy's will to resist. The enemy's *ability* to resist is important, too; but Japan, fanatical though she was, actually quit while she was still capable of resistance, thus saving us, and incidentally herself, a great many lives. If it were possible to scare the enemy into submission as Hitler virtually did in his conquest of Czechoslovakia, without the loss of a man on either side, that would, of course, be ideal. Ordinarily, however, the conquest of a major adversary will require two things: a certain amount of actual injury and a convincing threat of death.

Great injury can be done to an enemy from fixed positions, whether they be gun positions or strategic bomber bases. All that is required is a weapon that can reach a vulnerable spot, and logistical support for that weapon. A convincing threat of death, on the other hand, usually requires movement.

To visualize this, fancy yourself on the defensive side of an Infantry attack in a stabilized situation. You are in a trench with a rifle and bayonet and a few companions, and there is a dugout handy. As long as the enemy just shoots artillery, lobs in a mortar shell or two and fires machine-gun bullets over your head, you cover up and take it. You're uncomfortable and a little scared, and if there were any honorable way to get out of it, you'd leave; but there is no particular time at which you see imminent death staring you in the face—at which you have to choose your course once and for all. There is no breaking point, only a gradual increase in the noise and danger to which you are already accustomed, and you can usually accommodate yourself to the change.

But now you begin to see figures moving toward you—fleeting targets at which you fire, but which go down only to reappear still closer. Their bullets ping nearer and nearer so that you dare to pop up less and less often to shoot back. They are live men, determined to seek you out individually, to jab a bayonet between your ribs or, if you have taken refuge in the ground, to throw a grenade in beside you. Moreover, there are two or three of them to one of you.

Are you going to stand and die, or quit?

The whole point is that there must be a crescendo, an acceleration of the threat, a breaking point at which fright freezes into dumb terror and the defender can see only one way out. Can we get this effect with strategic bombers, 10 miles above the ground? Can we bring the enemy to the point where he will throw up his hands in panic, or can we only soften him gradually, so that when the airborne troops touch down for the main attack, he will give up more quickly?

As long as we just continue to pound, with no noticeable increase in intensity, a stubborn enemy will stick it out, as the British did during the bombing attacks of the first few years of war and again during the V-1 attacks. They will lose physical strength, but will gain spiritual strength and wait and hope for a chance to strike back. The British were able to hang on in the beginning because Hitler couldn't increase the pace sufficiently. Whether they could have lasted indefinitely against the V-1 and V-2 attack if it had not been stopped would have depended upon the degree of acceleration of the threat of death.

Whether the threat can be increased sufficiently by building more planes, or even bigger planes, is doubtful. A mere arithmetical rate of increase is probably insufficient. It must be geometric: it must be doubled and redoubled and redoubled, with the prospect of redoubling indefinitely. It will probably require a rapid increase in both loading and frequency of attack, such as can be attained only by moving our base of attack constantly forward—in effect, by closing with the enemy.

In such a maneuver, the strategic bomber will be the main offensive weapon, but it will be supported by ground, sea and short-range air weapons. There will be fighter and transport aircraft, surface and submarine ships, doughboys, leathernecks, and hairy-eared engineers. These latter will have the unenviable but essential job of building the bases for the bombers and other aircraft to fly from, whether on snow, ice or mud.

This, as was pointed out earlier, is the strategy that beat Japan. Reviewing this briefly, we see that the attack on Japan may be divided into two parts which differed in the means used to increase the threat of death. The joint task force that attacked from the south achieved it by movement. The bomber force in the Marianas achieved it by suddenly changing from explosives of the order of TNT to the atomic bomb. Since in any future war, we'll probably start out with the atomic bomb, and since there will probably not be an equal technical advance in our age, we shall probably be thrown back upon movement as our principal means of increasing the threat.

It must be recognized also that the strategy that succeeded against Japan, an island country with concentrated population, cannot be applied unaltered to an enemy occupying a continent. Suppose, for instance, that the enemy controlled

FLYING

"How I got in that wind tunnel in the first place I'll never know."

most of Europe and Asia, and had the bulk of his population and war potential distributed over a large area extending from the Dnieper River to the east side of the Urals and from the north side of the Black and Caspian Seas to the 60th parallel. With such a vast area to attack, how can we push our advance to the point where the enemy will have no choice but surrender or death?

The intensive use of atomic bombs is an immediate threat to everyone living in an organized community that can be reached by the bombers. It can be expected that when we have large fleets of bombers within range of all the important centers in the enemy's homeland, and have an ample supply of atomic bombs to annihilate them, he will surrender. To get some idea of what this may require, let us consider again the final attacks on Japan.

The B-29's that dropped the atomic bombs flew from the Marianas, 1,600 miles from Nagasaki; so we know that we can operate at that distance.

Let us take a piece of string and swing some 1,600-mile circles on the map from various parts of the Dnieper-Ural area. We find that, to reach the entire area from any one base, we would have to establish that base either in European countries east of the Baltic Sea or in Siberia or in the area bordering the Black and Caspian Seas. The chances are very much against our gaining access to any such area without a long, hard fight which might bog down into stabilized ground warfare.

If we retreat four or five hundred miles to the west and south, however, we find that we can swing intersecting circles which will cover all or most of the sensitive area from two or three points. At least two such points can be reached by water routes. These must be the objectives of our advance.

Now, we must assume that the enemy realizes this and will concentrate on excluding us from the key points. If there were really only two possibilities, this would be fairly easy for him; but he cannot know the exact limit of our bomber range, which may be more than 1,600 miles, nor can he ignore the possibility of invasion by ground forces. By means of feints and counter-intelligence work we can keep him guessing and force him to spread troops over most of his huge coastline and keep a large mobile reserve.

So when we land at our chosen base areas, it will be some time before we'll get a strong reaction by the enemy. This time must be used to disrupt his communications into the areas and to build up our own defenses.

Meanwhile, we must have a huge supply of atomic bombs, fuel and other munitions streaming across the ocean so that the main attack may be started with renewed fury. This, in turn, means an all-out effort on the home front to insure that the means are available and that there is no let-up. If the timing is right and the supply sufficient, this is the moment when a civilized government would yield to prevent useless slaughter.

We have, however, the experience of the Nazi government of Germany, which had nothing to do but commit suicide if

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it surrendered. It, therefore, did not surrender, but dispersed, leaving the German army and people without organized leadership or even the means to capitulate as a nation. Our next enemy may be an equally cynical and barbarous government.

In such a case, we shall have to proceed with the destruction until we are satisfied that there can be no effective resistance to the landing of a police force. We should not be easily convinced that this stage has been reached, for the enemy's ground army may still be intact, and it will be many times as large as the force that we can land against it. He may even be able to gain local air superiority with fighters based on dispersed fields.

Yet with vigorous use of air power, we can make the enemy's forces ineffective. To do this, we must immobilize them and break up their concentrations.

In the course of these operations, it may be necessary to establish fighter bases within the territory held by the enemy, so as to beat down his remaining air force and proceed against his ground troops without hindrance. This will take skill and daring, but it can be done.

The first requisite is military intelligence, to enable us to choose sites that will be within effective range of the enemy troop concentrations, but not dominated by existing enemy air bases. In some cases it may even be possible to seize enemy bases by direct airborne attack, thus killing two birds with one stone. In others, it may be necessary to make a step by step advance.

In either case, the next requirement is isolation of the selected site so that the enemy will not be able to counter-attack. In a country of highly organized communications, such as France or Germany, this would require a tremendous effort; but farther east it may mean only the interdiction of a few routes, and this may be greatly simplified by new weapons.

As city after city is destroyed and local air superiority is obtained progressively over the country, airborne troops will be landed to take over centers of food production and distribution, routes of communication and other key features.

Two auxiliary measures of almost equal importance are an intensive propaganda campaign before, during and after the arrival of the ground forces and an efficient military government to organize and control the population. The prompt seizure and intelligent use of radio and newspaper facilities, food supplies and utilities can greatly reduce the number of occupation troops needed.

Even with all this, there will be sniping, skirmishes and perhaps some pitched battles on the ground; but under ideal conditions no paratrooper should suffer anything worse than fallen arches. Considering that the striking power of an infantry division has been only slightly increased in recent years while air power has been magnified a hundred fold by the atomic bomb, it is only common sense to let the bomber do the heavy slugging. We must have the spirit of the Roman mother who would move up closer, but the weapon need no longer be the sword. END

Bug on a Trapeze

(*Continued from page* 31)

fins can be added to give greater fin area.

Besides meeting all these problems, McDonnell had to compress all the equipment of an operational fighter into the stubby barrel-shaped fuselage. In addition to the pilot and the 3,000-pound-thrust Westinghouse J-34 axial flow turbine, there must be fuel, armament, radio and radar equipment, and all the manifold gadgets and equipment necessary for a modern jet fighter.

The result is a plane which for the first time makes possible a concept of aerial operations akin to the Navy's idea of using an aircraft tender for fleet aerial operations. Not only will the XF-85 refuel in the bomb bay of the mother plane but it will receive limited servicing as well, including radio and radar repair, replenishment of oxygen and ammunition, and minor mechanical repairs.

Three of the little fighters can be carried in the bomb bays of a single B-36. The XF-85 is designed to protect the big bombers on long-range missions which are beyond the range of ordinary jets. It will operate at extreme altitudes. The pilot wears a heated flying suit, and is further equipped with a bail-out oxygen bottle and a high-speed ribbon-type parachute.

No armament or performance data has been released on the XF-85 except that the Air Force says "in speed it is comparable with other advanced jet fighters."

After its mission is accomplished, the XF-85 returns to its mother plane and hooks onto a "trapeze" as it flies beneath the larger plane.

Put your headset back on and listen to the radio conversation as Test Pilot Ed F. Schoch (pronounced "Shoke") hooks her onto the B-29. This is by far the trickiest operation in handling the speedy little parasite. The following scraps of radio conversation were recorded by Ed Peters, in charge of structures at McDonnell's Muroc project:

"Where is he . . . ?"

". . . Back a hundred yards . . ."

"I'm moving up now . . . moving pretty fast, can't we have more speed . . . ?"

"We've got 200 on . . ."

"He's under the tail and slowed down . . . Halfway to the trapeze . . ."

"I'm coming up now . . . Steady . . . In close, in close . . ."

"He missed. Another three inches would have done it . . ."

"Where is he?"

"Under the nose . . ."

"Ed, we're a long way from Muroc. Hold off until I turn and head back."

While this is going on, the little group has traveled 40 miles. From the other B-29 comes the word: "Al, I'll talk about his position all the way in, then Ed won't have to do it."

"Fifty feet below your tail . . . approaching nicely . . . up slow . . . gaining now, speed about right . . . close enough for one of your boys to talk . . . Doing fine, holding six feet behind and three down . . . Come on Ed, you're doing fine . . . *He's on!*"

But not all hook-ons are as successful as this. The XF-85 flew for the first time August 23, 1948. It was released from its specially adapted *Superfort* and flew for about 20 minutes. The air was rough, and as Test Pilot Schoch approached at 25,000 feet the B-29's trapeze smashed into the little plane's canopy, crushing the Plexiglas and knocking off Schoch's crash helmet and oxygen mask.

He jammed the oxygen hose in his mouth and made what may have been the world's fastest emergency landing—on the plane's single skid. The exact speed at which he came sliding into the Muroc desert has never been revealed. The only damage was a broken wing tip and a bent lower vertical fin. The plane and Ed Schoch were flying together again by October. END

Belly view of XF-85 shows skid on which Ed Schoch landed on Muroc desert. Barrel shape of plane is emphasized here. With multiple fins, it looks like a giant bomb with wings.

Colorado River Country

(*Continued from page 40*)

cost a bit more than average because the stuff is hauled in over some of the worst roads on earth. Aviation gas costs about 40 cents a gallon for the same reason.

If you hanker to "do" the country, it might cost you $50 or so to spend a couple of days at Goulding's. Harry runs scenic trips via station wagon and reconn car into Monument Valley and gives you entry to a photographer's paradise on earth.

Monument Valley is a vast amphitheater of monoliths that march in weird and stately procession as far as the eye can see. They tower up to 2,000 feet in straight shafts above the valley floor, and flying around through them will inspire even the most blasé pilot. If you're lucky, you'll be able to visit in the Navajo homes of Harry's friends and while on the 50-mile trip by car will get to eat with the Indians and come to know them as they really are—friendly, but shy and proud.

This is a place to stay overnight during the full moon, to feel the mysterious solitude of the desert and sense its ever-changing, uncountable moods. A moonlight night in Monument Valley is like living a few hours in another, more peaceful, more spiritual world.

Here, too, you can buy Navajo silversmithing and Indian blankets at their best: works of art that become collector's items.

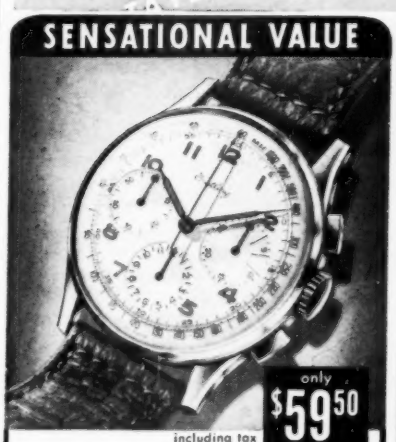
You'll want to spend a day or two flying out of Goulding's and Marble Canyon, too, but you'll need to get your main check points located carefully in your mind and avoid certain isolated and somewhat dangerous areas.

From either place, within a radius of 100 miles, you'll find so much scenery that it defies belief.

Goulding's is right on the state line, Marble Canyon only a few miles south of it. Midway between the two is Navajo Peak, a 10,000-foot monarch on the south side of the Colorado River Canyon. South of Navajo is the Rainbow Bridge Lodge, and several fields of corn mark the limited farming of the Indians. The terrain is fairly flat, and forced landings shouldn't worry you. No roads run directly between Goulding's and the peak, or between the peak and Marble Canyon, but the Indians pasture the whole range and you won't be out of gliding distance of a hogan most of the time.

Rainbow Bridge is on the north side of the peak, in a broken, rolling, tumbled canyon. Despite the fact that a *Stratocruiser* could fly through it, the great arch is dwarfed by its surroundings when viewed from the air. It remains as inspiring as Zane Grey described it in his unforgettable novel "The Rainbow Trail," a sequel to "Riders of the Purple Sage." If you want an expert's description of this never-never land, re-read those two books before your flight. This country, lying south of Price, Utah, to the Grand Canyon, is the land Zane Grey immortalized.

North of Goulding's store only 30 airline miles or so, lies the tortuous canyon of the San Juan River, which flows westerly from Farmington, N. M. The San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Juan "Goosenecks" are almost as famous as the Colorado River canyon and if you get plenty of altitude you can see them from a vantage point of complete safety.

Basing at Marble Canyon, you might want to fly up the river to Lee's Ferry and then turn northwest up the Paria River valley to the little settlement of Paria. There is a road all the way and you'll see something there that few people know about. In addition to canyons and rock temples that rival both Bryce Canyon and Zion Canyon National Parks, there are remarkable tributary canyons in the Paria River uplands and also into the Colorado near that point. They are so deep and so narrow they look like they have been gashed with the blade of a giant knife 20 miles long. Take a pound of butter and cut into it with a kitchen knife and you have the scale. They are over 2,000 feet deep—and at some points the near vertical walls are within spitting distance of each other. Old-time cattle rustlers and other badmen used to drive stolen livestock into them, where the animals found both feed and water in pastures that could be fenced off with a lariat, although they were miles and miles in length. Such incredible natural corrals would have staggered the imagination of Jules Verne.

From Paria settlement, there is a long, wide, flat "wash" leading up to Henryville, Tropic and Bryce Canyon. It is not a road, but cattle men often drive through in trucks and jeeps. If you don't want to leave the roads, you can turn southwest at Paria and follow a road around to Kanab, Utah, where western movies are often filmed, and where a large, paved airport is located not far from a picturesque little cattle town. Excellent lodges are located in Kanab, as it is a staging point for the Grand Canyon Lodge and on a main north-south highway.

South of Kanab is the little town of Fredonia, Ariz., with two airports located very close to the community. The road leads back eastward again over the Prismatic Plains, down into the Kaibab National Forest to Jacob's Lake and back to Marble Canyon. Or you can hold north, along the escarpment of the majestic Vermillion Cliffs and follow them straight into Marble Canyon airport.

Obviously, the Kaibab rims the north edge of Grand Canyon itself and you'll want to see that place without fail. However, we recommend that you follow the river down from Marble Canyon, and stay with the roads on the south rim, rather than fly over, across, around, or through the Grand. It's been done, but it isn't healthy.

Unless you are sharp on navigation and dead reckoning, the best way into Goulding's is out of Farmington, N. M., where you'll find a good airport and a cooperative operator who treats visiting pilots as though they were royalty.

From Farmington, you can go down to Shiprock for a look-see and then follow the San Juan out, admittedly over some pretty ugly country.

Otherwise, from the east, it would be best to take the low road, via Gallup, N. M., through Holbrook and Winslow, Ariz., to the cut-off east of the San Francisco mountains. Then fly into Cameron on the Little Colorado River, and north to Marble Canyon on an oiled road over the Painted Desert. From Marble to Goulding's you fly to Navajo Peak, then take a course due east into Monument Valley. You'd have to try pretty hard to miss it.

As you fly westbound from Winslow, incidentally, hold a heading of about 250° and have a gander at the biggest hole that was ever punched into the U.S.A.—the meteor crater a few miles southwest of the highway at Dennison. You won't have any trouble finding it—it would hold the entire population of this planet and a couple of others, with some room to spare. Airports are generally less than 50 miles apart on this and all other routes into the region.

Coming east from California on the "asphalt compass," it is best to turn northwest of the San Francisco range at Williams and reach the south rim lodge where the road jogs east into Cameron.

From Salt Lake City, pilots usually fly down those well defined valleys, some-

SOME AIRPORTS SERVING COLORADO RIVER COUNTRY

Airport (longitude and latitude)	Altitude	Nearest Town and Distance	Number of Runways	Length of Longest Runway	Gasoline Grades	Service Facilities	Write to:
Carbon County Municipal (39°37'-110°45')	5,800 ft.	Price, Utah 5 mi.	3	5,600 ft.	80-91	A & E	E. L. (Buck) Davis, Price, Utah
Moab, Utah		CLOSED (UNDER CONSTRUCTION)					
Monticello, Utah (State strip) (37°54'-109°15')	6,900 ft.	Monticello, Utah 6 mi.	1	4,800 ft.		None	Melvin Frost, Monticello, Utah
Blanding, Utah, Municipal (37°35'-109°29')	5,800 ft.	Blanding, Utah 4 mi.	1	4,000 ft.	80	A & E (Part time)	Don E. Smith, Blanding, Utah
*Mexican Hat, Utah (Private strip) (37°10'-109°53')	4,400 ft.	Bluff, Utah 24 mi.	1	2,600 ft.		None	Norman Nevills, Mexican Hat Bluff, Utah
Monument Valley (Private strip) (37°01'-110°12')	5,284 ft.	Bluff, Utah 36 mi.	1	3,500 ft.	80	None	Harry Goulding, Monument Valley, Arizona
Kanab, Utah, Municipal (37°01'-112°32')	4,858 ft.	Kanab, Utah 4 mi.		5,300 ft.	80	None	Chamber of Commerce, Kanab, Utah
Bryce Canyon, Utah (CAA intermediate) (37°42'-112°10')	7,580 ft.	Tropic, Utah 5 mi.	1	6,000 ft.	80	A & E (Part time)	CAA Superintendent on field
Hanksville, Utah (CAA intermediate) (38°25'-110°42')	4,480 ft.	Hanksville, Utah	1	5,500 ft.	80	None	CAA Superintendent on field
Wayne Wonderland Airport (38°22'-111°36')	7,020 ft.	Loa, Utah	1	7,000 ft.		None	Harold Ekker, County Commissioner
Torrey, Utah (State emergency field) (38°17'-111°25')	6,800 ft.	Torrey, Utah	1	3,500 ft.		None	EMERGENCY ONLY
Cedar City, Utah, Municipal (37°42'-113°06')	5,660 ft.	Cedar City, Utah 3 mi.	2	5,500 ft.	80-91	A & E	Royce Knight, Cedar City, Utah
Cameron, Arizona, Municipal (35°53'-111°24')	4,200 ft.	Cameron, Arizona 1 mi.	2	4,000 ft.	80-91	A & E	Airport Manager, Cameron, Arizona
Marble Canyon (Private strip) (36°48'-111°40')	3,580 ft.	Cameron, Arizona 65 mi.	1	5,000 ft.	80	None	Art Green, Marble Canyon, Arizona
Grand Canyon, Arizona (State park) (35°51'-112°06')	6,362 ft.	Williams, Arizona 50 mi.	1	5,300 ft.	80	A & E	Grand Canyon, South Rim Airport, Arizona
Kaibab Forest, Arizona (36°25'-112°08')	8,950 ft.	Fredonia, Arizona 50 mi.	1	3,000 ft.		None	EMERGENCY ONLY
Williams, Arizona, Municipal (35°19'-112°12')	6,600 ft.	Williams, Arizona 4.3 mi.		3,900 ft.	80-91	A & E	Airport Operator, Williams, Arizona
Flagstaff, Arizona, Municipal (36°16'-111°31')	6,587 ft.	Flagstaff, Arizona 10 mi.		6,000 ft.	80-91	A & E	Airport Manager, Flagstaff, Arizona
Winslow, Arizona, Municipal (35°02'-110°44')	4,937 ft.	Winslow, Arizona 2 mi.	3	7,500 ft.	80-91	A & E	Airport Manager, Winslow, Arizona
St. Michaels, Arizona (35°39'-109°05')	6,800 ft.	St. Michaels, Arizona 2 mi.	1	5,200 ft.		None	EMERGENCY ONLY
Farmington, New Mexico, Municipal	5,497 ft.	Farmington, New Mex. 1 mi.	3	5,000 ft.	80-91	A & E	(Monarch Air Line)
Cortez, Colorado, Municipal	5,915 ft.	Cortez, Colorado 1 mi.	2	4,000 ft.	80	A & E	Airport Manager, Cortez, Colorado

* Short field—not recommended for inexperienced pilots.

times via Cedar City and then east over the mountains to Kanab, and sometimes down via Salina or Richfield into the Bryce Canyon region. You can land at Bryce on a paved runway 6,000 feet long and nearly 7,600 feet above sea level. Bryce Lodge is closed in April and May, but cabins and meals (at average tourist country rates) can be obtained one mile from the airport at Ruby's Inn.

From Bryce we generally strike right out down the Paria River into Lee's Ferry, but there is also a road a few miles west of Bryce that leads to Kanab via Orderville and a series of valleys.

Another route is via Price and Green River, Utah, and thence along a road to Moab, or from Grand Junction, Colo., to Moab, where there's an airport a long way from town and no gas. You fly through a basin of amphitheaters and monoliths to Monticello, Utah, and from there to Blanding where gas, cafe and cabin camps are all up to par and readily available.

Taking off from Blanding you go south to Bluff, then southwest to Mexican Hat on the San Juan River, just above the "Goosenecks" and along a winding dirt road another 30 miles or so to Goulding's.

There is a strip at Mexican Hat operated by Norman Nevilles, the famous boatman.

It's easy to get lost in this country, in spite of prominent landmarks visible for 75 to 100 miles.

We always fly from point to point—with a definite course laid out and a definite E.T.A. It is mighty tempting to just get out there and wander around sightseeing in open-mouthed awe with a few chills running up your back. But unless you have homing pigeon blood it can be touchy to get re-oriented.

One tip: the whole basin is only a couple of hundred miles across and the river is in the middle. If you're on the river and worried about navigation and gas, turn to the east and fly a straight heading. There are several prominent mountain masses and all of them have "civilization" at the bases. You can't fly more than an hour east from the river without hitting a main highway.

You'll have to watch the weather and wind. The country can conjure up thunderstorms that will make your blood run cold, but you can usually see them 60 miles away anytime of the day or night.

Winds are generally westerly and southwesterly.

Keep tab on the main roads, learn your check points, don't be afraid to ask questions of the natives, and always take off with a full tank of gas. Treat the people right and they'll see to it that you have a vacation you'll never forget in the greatest wonderland on earth. END

Mountain Flying

(*Continued from page* 28)

of riding a heavy airplane or a light airplane into a pile of outcroppings, which would you take?

"It is quite true that there are many exceptions to the rules in mountain flying. However, the test comes in a pilot learning the exceptions too, and interpreting the unusual conditions he encounters, thereby attempting to avoid unfavorable conditions.

"Such an interpretation could have been used to avoid the unhappy instance cited on Mr. Sherred's trip from Denver to Farmington. Few of the old boys up here in Idaho continue to fight a continuous down draft such as the one encountered. It is almost a sure bet that the reciprocal of the down draft will be met under the conditions described, and with it extreme turbulence."

In our own mountain flying we make extensive use of *Navions*. We operate over extremely rough terrain and demand a plane that is easy to put down in a small spot in forced landings. We also have plenty of short rough fields. Many of them are not level, sloping not only up and down the runway but across the runway. Many of these fields are located so that landings can be made in only one direction and take-offs in the other regardless of wind direction. Nearly all of these fields are natural strips or shelves. Very little, if any, maintenance is done on them. Occasionally the forest service will drag the weeds and grass.

An example is Soldier Bar, a United States forestry strip located at 4,190 feet on Big Creek about eight miles upstream from the middle fork of Idaho's Salmon River. The nearest town of any size is Salmon, about 45 miles east. This forestry strip is a natural shelf on the side of the mountain. The shelf is approximately 800 feet above Big Creek. It's about a 20-minute walk down-trail, and 30 minutes up-trail to and from the creek.

In addition to serving as a forestry strip for aid in fire fighting, planes are flown in here for hunting and fishing, and to bring in supplies to a ranch nearby. Deer, elk, mountain sheep, mountain goats and mountain lions are hunted in the immediate vicinity. Deer and elk are around the field and occasionally on it. Sheep and goats can be found on the rocky cliffs directly above the field.

Landing on and taking off from Soldier Bar require a special technique which has become so common with our *Navions* that it is practically routine. Landings should be up-hill, toward the trees in the photograph on page 28. An airplane is much easier to stop landing up hill, even with a tail wind, than landing down hill with a fairly strong head wind. The ridge and trees on the upper end of the field, however, make it a one-way field for practical purposes, regardless.

Since the field has an abrupt drop-off and down drafts are a strong likelihood, it is necessary to drag the field at low altitude going down the field to check for down drafts off the approach end. When dragging the field low like this, we also check the altimeter for an accurate field height reading. This is important because pilots must start the approach down the canyon and out of sight of the field.

A ridge juts out onto final approach;

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after passing this ridge on final it is necessary to swing toward the hill in order to line up with the landing strip.

A pilot who has no mountain experience must guard against an optical illusion when approaching a field that slopes. The power approach landing is the only practical kind for mountain fields—and when approaching a field that slopes the pilot will instinctively line up with the angle or slope of the field and instead of dragging it in level as it appears to him, he actually climbs up hill. Since he doesn't know he is trying to climb, he will fail to use enough power and the airspeed will reach a critical point. The approaches to most mountain fields are so close to obstacles that a pilot must fly his airplane by sight and feel. He has little or no time to check instruments.

Take-offs from Soldier Bar, compared with the landings, are relatively simple. We take off down hill even if we have a tail wind. Because of dips in the field, pilots must hold the tail fairly high until plenty of flying speed is reached. The tricycle gear of our *Navions* makes this easy, but with a normal gear it is easy to damage a prop when going through a dip. We don't have to worry much about running out of field because if we are not flying when we reach the end we have plenty of altitude and need only to dive and make a slight turn to go down the canyon.

Last October 15, Glen Eichelberger and I each flew a *Navion* in to Soldier Bar Landing Strip to pick up two hunters we had left there two weeks before. They had promised that each would have an elk waiting to be flown out.

Our procedure was to fly over the field at low approach altitude, noting the altimeter reading, make a steep turnaround in the canyon, and prepare for the actual approach and landing.

The size of those two bull elk was a sight to behold. With one elk and one passenger in each plane we taxied to the upper end of the sloping strip and prepared for take-off with 30° of flaps. With this greater than usual flap setting I was in hopes of becoming airborne after hitting the huge dip that is near the middle of the field. I expected to use the full 900 feet of useable space for take-off and was pleasantly surprised to find myself airborne in about 700 feet—and that is after having ploughed through the dip.

Back at Bradley Field in Boise we were curious to know our actual load. The scales showed 540 pounds of elk and hunting gear plus passenger and pilot in one *Navion* and 525 pounds of elk and hunting gear plus passenger and pilot in the other.

The Idaho Primitive Area covers about 1,000,000 acres. Road construction is prohibited. It requires several days by pack train to pack into many of the spots we fly into in one to 1½ hours.

Our mountains average between 7,000 and 12,000 feet high. At such an altitude there is a strong wind blowing a large part of the time. Pilots flying in the mountains must expect extreme turbulence with violent updrafts and downdrafts whenever there is much wind.

Pilots should also be aware of a number of elementary but important problems they will encounter in the mountains:

Engines will put out less power, hence will give less performance.

Pilots will be fatigued from flying prolonged periods over 10,000 feet without oxygen.

There is a deceptive relationship between ground speed and airspeed in landings at high altitudes.

High wind conditions are more prevalent at altitude, usually resulting in turbulence.

MODEL COCKPITS

TO STANDARDIZE crew-member stations for Air Force planes, Goodyear Aircraft Corporation recently completed Air Materiel Command orders of cockpit mockup models for fighters, tandem bombers, cargo planes and very heavy bombers.

The VHB mockup, by far the largest of the four, has the pilot located in the cockpit on the fuselage's centerline enclosed in a fighter-type canopy. Flight engineer is directly below and behind the pilot. The co-pilot sits directly to the engineer's left, with visibility out the side windows. The cockpit will be used as a guide and standard for future very heavy bomber cockpits.

Thirteen basic principles were considered, among them transfer of control and vision, functional arrangement of control, conservation of space, standardization of controls, crew comfort, emergency escapes, safety operation and efficiency of arrangement.

To meet these conditions you will want an airplane with rugged structural strength, excellent stall characteristics, good vision, good brakes.

Late in November, Chester A. Moulton, Idaho Director of Aeronautics, and I flew a couple of portable two-way radios to McCall to be included in a load of supplies for a *Travelaire* 6,000 which was to drop the load on Bruce Meadows where several hunters were stranded. A bad storm was approaching and the *Travelaire* hadn't shown up. The storm was about to close in the whole area and we were worried for fear that we wouldn't be able to get supplies to the marooned hunters.

We knew the McCall field had been rolled, but when we landed our plane had hardly any landing roll because there was about five inches of fresh snow on top of the rolled layer and we kept breaking through the hard layer underneath. It took nearly full throttle to taxi at all. Because of the oncoming storm we decided to drop the bundle and the bed roll from the *Navion*.

McCall is at 5,000 feet and I had serious doubts that we could take off in the snow with our load of Moulton, myself, and 250 pounds of supplies. We had a 90° crosswind from the left at 5 to 10 m.p.h.

I dropped about half flaps and applied full power. As the plane began to roll I pulled the wheel clear back and the nose wheel rose out of the snow and the plane began to gain speed rapidly. In about 100 feet it was no longer breaking through the lower crust, and in about one-half the field we were airborne. I should judge the length of take-off as about 1,200 to 1,500 feet. This performance was remarkable to me.

Once in the air we had to outrun the storm which had already begun to pass over our heads. It was moving about 50 m.p.h. and the ceiling was rapidly dropping to the ground. The storm had about a 10-mile edge on us, and all we had to do was to outrun it. We took a direct course from McCall to Bruce Meadows, which is over some pretty rugged country. We broke out ahead of the storm about 35 miles out of McCall and about 16 miles from Bruce Meadows. This didn't give us much time.

The supplies were in a large mail sack and we decided to drop them all at once. The sack was about two feet in diameter and we had to open the canopy fully and slow fly the plane at about 75 m.p.h., drop the sack on the wing and let it slide off. We were 50 to 100 feet off the ground, flying only 75 m.p.h. in turbulent air just ahead of a storm—and at an altitude of 6,400 feet. When the sack hit the wing, it stalled out that portion of the wing and caused the right wing to drop, but aileron quickly righted it.

We had to take a circuitous route southeast and gradually head back west to get ahead of the storm and back to Boise. But there is one important lesson in this incident for all mountain pilots: *know your plane's performance and what it will and will not do.*

Yes, our experience has been that small planes are not only satisfactory for mountain flying but are safer than big planes. If this needs any emphasis, I'd like Bill Woods to make the point. He says:

"I have flown the 'mountains' between 2,000 and 3,000 hours in 'light' planes and between 9,000 and 10,000 hours in planes weighing from a ton and a half up to five tons, and the only reason that I have so much more time in the heavier plane is that it will carry a greater load. As far as safety is concerned the lightplane is so far ahead of the heavier plane there can be absolutely no comparison." END

How to Fly the Omni

(Continued from page 21)

pilot what direction the station he is receiving is from him rather than the direction the airplane may be pointing.

An accurate fix may be obtained rapidly by tuning in two omni-range stations, noting the bearing indications which appear on the Omniscope, and plotting the intersection on a map. There is no bearing indication unless a signal from the omni-range station actually is being received.

The Omnimatic equipment is also adaptable to ILS, and provisions have been made for a simple switch which will convert the bearing indicating pattern on the Omniscope to an accurate left-right indication for airport runway approaches.

The Omnimatic system weighs 24 pounds and can be installed for about $700. This includes Omniscope, two-way VHF radio, and amplifier. Dependable bearings can be obtained up to and beyond 100 miles, Lear engineers say.

An understanding of the principles on which the omni-ranges work helps to understand the accuracy of the system. In the 1920s, the British had a navigation system using radio beam signals, sweeping a circle. A 360° broadcast code was given when the beam swept due north. Then the beam continued around the compass and at reaching north, sounded a general signal again. The airmen, by timing the signal on their stop watches, would start the watches at the "north" signal and time the interval until the sweep of the beam reached them. The time indicated their direction from the station. If the interval was, say 10 seconds, their azimuth might be 60°. If it was 20 seconds it might be 120°.

The omni-ranges work in exactly the same way except that the radio beams sweep many times per second and the timing is done electronically.

The omni-range navigation systems will lay an invisible road from any omni station to any point on the compass. Far from being confined to the airways, the aerial highway is completely flexible. With their more elaborate equipment, the airlines can fly any number of tracks away from the direct course. Approaches to the airport can be made from any direction, and the omni navigation can be aimed to right or to left of the final destination.

Omni navigation systems, though expensive, enormously simplify cross-country flying. When they are functioning they make unnecessary many of the fussy cross-country navigation calculations which pilots have followed for years. And when they fail, they "fail safe." END

Stop That Fire

(Continued from page 42)

are the thermocouple type, acting on the rate-of-rise principle. These units have the added advantage of being able to indicate when dangerously high ambient temperatures are occurring within any area of the power section, which gives the pilot an obvious added margin of safety.

Installation is usually by means of Adel "Q" clips, attached preferably by screws or bolts instead of rivets to existing structures such as the firewall, motor mount or oil cooler flange. (Details of a typical installation are shown in the illustration on page 42.)

For most planes, an average of four or five units per installation is sufficient, placed at all points of air exit and in all dead-air areas. A typical layout would call for a thermocouple mounted aft of the oil cooler, one on each upper side of the firewall, one aft of the carburetor air intake, and an optional installation at some other point—such as under the aircraft's generator.

The *Seabee*, and similar power plant

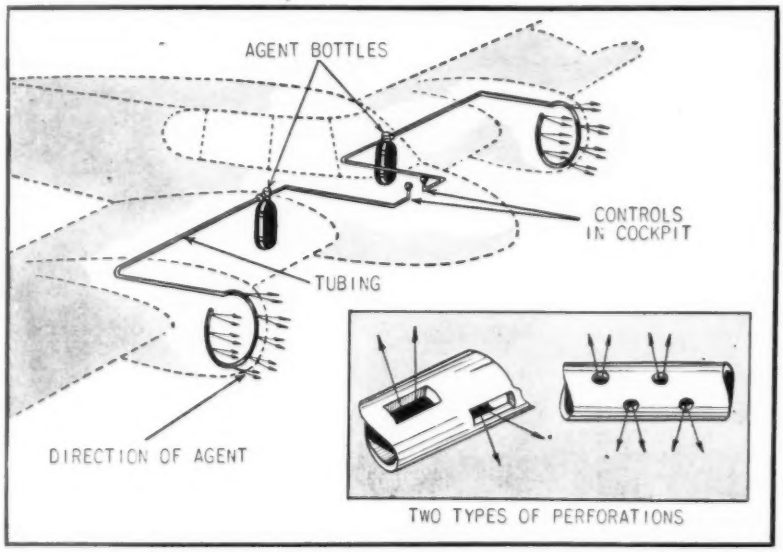

Figure 3. Typical extinguishing system for twin-engined plane. (See page 74.)

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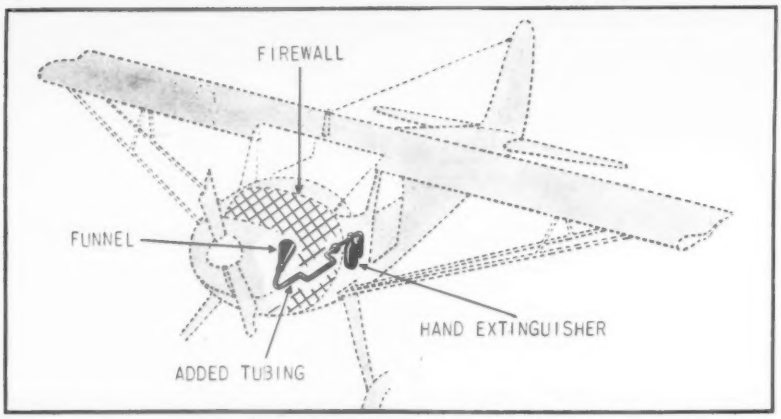

Figure 4. An inexpensive extinguishing system for lightplanes uses 1/4-pound bottle of CO_2.

installations which are completely separated from the accessory section, should mount an additional two units on the sides of the nacelle, aft of the theoretical center line of the accessory section. Twenty inches between the units is the maximum for all installations. Because of its efficiency, fast reaction, extremely low weight and ease of installation I recommend equipment manufactured by the Edison Instrument Company.

Twin-engined jobs should carry both detection and extinguishing systems. The system should comprise aluminum tubing of 3/8 inch diameter, fed from two 1¼-pound methyl bromide bottles mounted as close to the wing root as possible. The tubing should encircle the aft face of radial cylinders and should weave in and out along the bottom of in-line engines, with perforations by holes or slots pointing up and *forward* toward the face of the cylinder.

Where there is a separate accessory section, a run-off tube should be included. A typical system is shown in Fig. 3 (on page 73) and may be used for one- or two-engined planes. With the type of equipment available the pilot-owner can easily install his own system in a couple of hours—assuming he is licensed.

From personal experience, I recommend the following procedure, in flight, at the first indication of fire, when the lightplane does not carry a fire extinguishing system:

The pilot should shut off his fuel flow immediately—allow the engine to continue turning over for a few seconds to allow any fuel in the lines beyond the selector cock to be exhausted—then kill the engine and put the plane into a steep side-slip (to keep the flames away from the cockpit); the slip should be maintained until the fire has been blown out. If the fire burns fiercely, then it has its origin above the selector cock and the pilot should bail out if he has a chute. But if the fire originated amid combustibles or from fuel leaks *below* the selector cock, the above procedure should handle it.

When a plane has no controllable vent louvres, an inexpensive and practical extinguishing system can be made by following Fig. 4. This comprises a 1¼-pound hand extinguisher bottle of CO_2 mounted near the pilot's left leg in the cockpit. The flared funnel is removed and the connection on top of the bottle is mounted through the firewall. An additional length of tubing or hose is attached to the bottle from the forward side of the firewall and the funnel is put on the free end of the tubing and hung on existing structure so that it points up and aft at 45° between the oil cooler and rear cylinders.

At the first indication of fire, the procedure outlined above is followed. As the plane begins to side-slip, the bottle is pulled (with one hand) until empty—usually three to five seconds. The pilot then should land as soon as possible and the engine should not be started again until it has been checked and inspected on the ground.

All break-throughs at the firewall should be fire-proofed with shields or fire-resistant grommets. END

Fuel Injection

(Continued from page 33)

injection are actually simpler, and flat engines can be designed for better concealed airplane wing and hull installations.

Engines with fuel injection are as simple to operate as those with carburetors. Here is the typical starting procedure. The engine is turned over several times with the throttle wide open, the throttle is closed and the engine turned through two or three additional turns. Then the throttle is opened slightly, ignition turned on, and the engine cranked. In hot weather the injector reservoir should be filled by the hand supply pump in the airplane because the fuel in the reservoir may have evaporated. Otherwise there's nothing different about the operation.

Fuel injection for small aircraft engines is not new. Approximately 1,000 installations were made on Continental engines in 1940. Since the end of the war, Ex-Cell-O has sold more than 2,000 injection systems for personal planes to manufacturers. Most of them have been installed in Culvers, Aeroncas, and Canadian *Canucks* made by Fleet Manufacturing and Aircraft, Ltd., Fort Erie, Ont. Aeronca also delivered about 700 L-16A and L-16B liaison craft with fuel injection for the Army Ground Forces and the National Guard.

Additional cost of fuel injection over a conventional float type carburetor is approximately $100 to $150 for a small four-cylinder engine. Most installations have been made on Continental A-65, C-75, C-85, and C-90 engines.

At least four methods are currently being used for metering fuel and air on fuel injection-equipped engines. The Ex-Cell-O system is the only one currently being used on lightplane engines and Ex-Cell-O is the only company now building such systems for small engines.

The system consists of four units (a) a fuel metering and injection pump, (b) an air metering throttle and control linkage, (c) discharge lines, and (d) atomizing nozzles. See the illustration on page 33 for a cutaway diagram of this system.

All gasoline engines require a definite fuel-air mixture at each load and speed. The exact requirements are determined by test for each engine model. The air throttle and fuel metering valve are then calibrated to provide this mixture, and linked together to automatically meet the engine requirements for each position of the throttle.

The fuel is pumped to a fuel reservoir at about twice the rate required by the engine. Thus about half the fuel delivered by the supply pump is by-passed through the return line. Pressure in the reservoir is controlled by restricting the flow of the by-passed fuel. The by-pass helps to cool the injection pump and eliminates any tendency to vapor lock while in operation.

The fuel then passes through the fuel metering valve, located between the fuel reservoir and the line leading to the pumping and distributing plunger. Fuel quantity to the plunger is varied by changing the fuel pressure and size of the fuel metering valve orifice. By controlling these two, the desired amount of fuel is delivered to the pumping plunger. The plunger operates in a steel sleeve and is driven through gears at one-half engine speed.

The nozzles atomize the fuel delivered by the pumping and distributing plunger. They are located in the air intake manifold just ahead of and directed at the engine intake valves. The nozzle body contains a valve plunger, normally held in a closed position by a spring. It is forced down by pressure of the fuel to permit unrestricted passage through to the atomizing ducts. Here atomization is obtained by whirling the fuel in a central orifice, from which it is discharged into the air stream. After delivery of the fuel charge, the valve plunger is returned to the closed position by the spring, providing a seal against manifold suction. END

Group 71

(*Continued from page* 18)

stopped just short of the bridge, his left wing and landing gear washed out against a stack. The plane was a strike.

This wasn't the only bad luck of the day. *Hellcat* V-5, flown by Lieut. Bill Strahan made a good landing but the arresting cable pulled out of its socket and he rammed the barrier wires. There appeared to be no permanent damage to the plane except to the propeller. Two other accidents marred the second day of operations. Lieut. (jg) Raymond Kerr, a machinist in civilian life, flying a *Hellcat*, engaged No. 5 cable on a landing but it stretched too much and he wrapped his prop around a barrier wire. A little later Lieut. (jg) Dick Miller, an insurance broker, drifted too far to port and one wheel went off the deck after he had engaged the arresting gear. No one was hurt in any of these mishaps and damages were minor except in the first crash.

After the first day's operations, Charlie Boldt, who was LSO on the *Leyte* until just prior to the *Cabot's* cruise, went over the mistakes in detail. "Most of you men went too wide," he said. "Joe, you got a little too close. Your first was a nice landing. But on the next one you were high and fast all the way around.

"Weir, you got your nose down. Keep you nose up all the way. One twenty-six? Who was flying 126? Homfelt. You dropped the nose all the way, and let yourself drift across the ramp. Remember, after you cut keep your heels on the floor, not on the brakes."

The pilots agreed that they were a bit ragged the first day. But they had already begun to smooth out noticeably by the second. They were congratulated by Captain King, the skipper. "You have now shaken down," he said in an announcement over the ship's public address system. "I give the air group from Glenview and Chicago a well-done."

Gunnery practice on the third day was surprisingly sharp. The pilots fired machine guns from the *Hellcats*, and rockets and machine guns from the *Avengers* at a spar towed behind the carrier at 15 knots. The men and pilots began to show enthusiasm about their progress. Havana, Cuba, was the official port of call and the *Cabot* spent two days in port. Progress continued on the remainder of the cruise.

Lieutenant Commander West was pleased with the results. West was commissioned in the Navy in 1940 and left in 1946, only to sign up with the reserves as soon as they organized July 1, 1946. He has headed the air group since March, 1947. West made the first carrier landing of the cruise, though he had not landed on a carrier since August, 1945.

"All our pilots were formerly on a par with fleet squadrons, and it wouldn't be too much of a task to bring them up to those standards again," West said. "I believe that if we can keep a bunch of boys like this, they would be trained and ready to go aboard a carrier before the carrier could be gotten out of mothballs.

"Of course, it's a lot of hard work," West went on. "Employers have to cooperate. Our men have to have enough guts to tell their wives to go to hell, because it is surely a sacrifice of their time."

LSO Boldt explained that the Glenview men each were supposed to have made 60 field landings at Pensacola before going on the carrier but bad weather prevented this training. "The pilots have been doing pretty well," Boldt said. "I'm surprised. I didn't think they'd be doing as well as they have."

The deck crews tended to be slower and not quite certain of what they were doing—especially in the first part of the cruise. Typical was the manner in which target practice was snafued on the third morning. Two *Avengers* were to go aloft carrying photographers. It was felt undesirable to fire live rockets with the photographers aboard, so the order went out to take the rockets off. By the time the order had been passed down, the rockets were off the other *Avengers* too and there wasn't time to put them back on. Instead of 42 rockets being fired that morning there were only about 10.

One deck officer said, "They're entitled to at least one snafu."

"It's good to be back in the groove again; it's like old times," said Lieut. (jg) Fred A. Hill, of Oak Park, a real estate salesman. "This is the first time I've flown from carriers for four years. I think it's a damned good thing. Operations are good and a lot of roughness is out of the way. We're shaping up."

Hill added: "Remember, too, that our crews are green, but I think they're doing a darned good job. Lots of them are fresh recruits who have never been on a carrier before or seen a carrier landing."

Captain King was especially enthusiastic. "During the war these men were combat pilots, as good as anything we had," he said. "In no time at all they could be ready for combat again. The things that were wrong with operations were the ship's fault, not theirs."

Captain King had his own special problems in operating, however. The *Cabot* which he commands was originally laid down as a cruiser April 11, 1942, but her plans were soon changed and she ended up as an aircraft carrier. She fought through the Pacific War and was put in "mothballs" late in 1945. The *Cabot* was recalled to active service and recommissioned on Navy Day, October 27, 1948. She is still coming out of mothballs, how-

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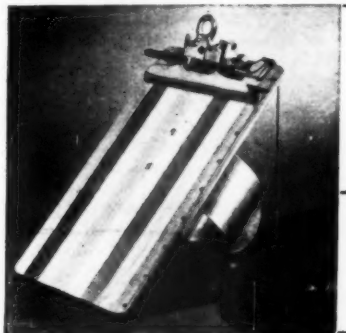

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ever, and was still a green ship with a crew who had never operated with a full air group until CVEG-71 came aboard.

Admiral Whitehead, who kept close tab on all activities, is a former Reserve officer who served in the Navy throughout World War I and was commissioned in the regular Navy shortly afterward. A tall, handsome, gray-haired man, he was commander of the Support Aircraft Air Force of the Pacific Fleet during the greater part of the war. He commanded the mighty *Shangri-la* during part of the war, and was largely responsible for the conversion of two Great Lakes excursion boats to the *Sable* and *Wolverine* carriers, which qualified 18,000 Navy pilots during the war.

"At the end of only three days I could see these boys were beginning to smooth out," Admiral Whitehead said. He observed many instances of sloppy operation, however. In one case a green deck man almost directed a plane into a barrier that had malfunctioned. Only a hooted warning from the bridge saved the plane's prop and quite likely its engine.

"That fellow should have been looking," the admiral said. "He's probably never been told that."

Admiral Whitehead is not altogether sold on carrier operations for Reserve groups for their entire two weeks' annual training duty. "I think they should train for carrier operations as they do now as part of the overall training syllabus," he explains. "We can get much more time in the air and actual training in the use of primary weapons by operating from bases ashore. The fundamental work such as coordination of effort, fighter controlling, gunnery and so on are extremely important. The men soon get the feel of the carrier for landing and taking off and after a month or so, landing and taking-off are just routine matters."

He points out that any carrier pilots who have not flown on or off decks for three months are required to qualify anew. Obviously it is impossible to give the Reserves this kind of training every three months. The admiral believes that if the Reserves were needed in an emergency they could be gotten ready in a hurry—even though with a yearly cruise they could not be expected to maintain carrier qualification for the whole year.

One of the biggest Reserve problems, the admiral has found, is recruiting and maintaining the interest of enlisted men. He believes that an important reason is that so many of the young officers trained during the war were instructed in specialized jobs and were never taught the principles of leadership. The admiral also feels that carrier cruises for Naval air reserves assist in maintaining a high morale among officer and enlisted personnel and aid recruiting.

CVEG-71 is 100 per cent filled as far as officer personnel is concerned, and 90 per cent filled with enlisted personnel. The 16 non-flying officers include air combat intelligence, ordnance, engineering, flight deck, supply, combat intelligence center, and administrative personnel. The 152 enlisted men fill such jobs as supply, administration, deck crews, ordnance crews, engineering (maintenance) crews, and engineering specialist jobs.

The group is completely staffed to operate as a combat-ready organization except for the following: additional flight deck crewmen, hangar deck crewmen (mostly engineering and maintenance), ship's communications, electronic maintenance personnel, and a catapult officer and crew. The men of the *Cabot* filled these gaps in the group's operations.

Officers and men of the Glenview weekend warriors devote two days each month to their Reserve activities, in addition to two weeks of active duty each year. Pilots fly a minimum of 100 hours per year.

Their work on the cruise gave the Navy its answer on the value of Reserve training. Lieut. Comdr. D. H. ("Danny") Deaver, Combat Intelligence Center officer, who acted as administrative assistant on the cruise, estimates that the group, with minimum additional training, could have operated as a combat-ready organization 18 months after its start. Admiral Whitehead believes that CVEG-71, including most of its entire personnel complement, would have been ready for combat by the end of the training period. Applied to the rest of the Reserve, this accomplishment signifies that the Navy's 55 Reserve air groups could be ready to man the same number of carriers of the mothball fleet before the carriers themselves could be put into operation. END

First Ride

(Continued from page 29)

and, besides, it takes too much time.

At the end of the runway, rev up your engine again and switch from mag to mag slowly. It will increase his respect for your knowledge of intricate powerplants. Lean over and check his safety belt once more, and then wipe the palms of your hands with your handkerchief. This is IT.

Your take-off should be made especially interesting . . . not just the routine straight and level affair, but with some yaws and banks to let him know he's really in the air. Of course you might prefer to add a bit of novelty to your take-off with a first-flight passenger by holding her on the ground clear to the end of the runway and then hoisting her right up past the factory windows. That really gives the "first" passenger a bang.

In the air and away from the field you can settle down to giving the passenger a good time. Most first-flighters are disappointed in the smoothness of the ride and the ease with which the pilot flies the aircraft—but not your passenger!

Fly smoothly only until you spot something of interest on the ground (anything will do), then put the ship in about a 50° bank and circle it briskly a few times, yelling to him all the time to look at it. If he refuses to open his eyes, do a fast slip right down to the tree tops so that he can't miss it.

If you have a chance to go cross-country during the ride make it look rugged. Be sure you have plenty of maps aboard and fold and refold them as you fly, keeping the plane more or less level with your knees. Use a pair of dividers too if you can and check your compass repeatedly. This makes it appear very technical. Peer out of the ship in all directions and do an occasional fast "180" to look over some check point again. That shows caution and attention to detail.

While on the way you can demonstrate some of the more interesting maneuvers such as spins and stalls. Be subtle. Do not tell your passenger that you are going to demonstrate anything. Raise the nose higher and higher as you work the throttle back. The passenger may not notice it at all. If he does belt you in the back and scream "Whasamatter?" just shrug your shoulders and keep that nose coming up until it breaks in a brisk stall. They love it. After you have pulled out of it and the passenger has returned to normal color explain that stalls are harmless unless you fall off into a spin from a stall low down.

A little later, to demonstrate, do a brisk power-on stall but kick it into a spin as the stall breaks to illustrate what you meant by a stall being safe unless you developed a spin from it. To be sure he doesn't miss what is happening shriek: "We're in a spin!" several times before you let the ship come out of it by itself. He will probably remember the maneuver better this way and much longer.

Never let a first flighter touch the controls—not but what he could probably land it himself if he had to—but it makes it look much harder to him if he doesn't find out how ridiculously simple it really is. Keep it looking technical, checking your instruments all the time, looking out at "that wing" frequently, and changing throttle setting suddenly. He'll know you are doing your best to make the flight safe and interesting for him.

When you get back to the field once more, don't just go on in and land. Drag the field first, fish-tailing nicely as you do, then go around again, to let him know it is no easy matter setting a plane down. Go around several times if need be for the desired effect, then make a long straight approach watching your instruments all the while, shaking your head occasionally as though you aren't quite satisfied with the way the landing is going. At the touch-down "stir-the-stick" a little to make it look like a battle to hold it level and let her roll almost to the end of the runway before turning off onto the grass or taxi strip.

Once off the runway, slump slightly in your seat as if it had been almost too much for you, then, with a "carry-on-old-man" smile, taxi back to the hangar, waving to anyone who happens to be hanging around watching, whether they appear glad to see you or not.

Well, you have given your passenger his first ride. You have been loyal. You have been out to sell aviation. You are the kind of pilot we have too many of in this business of ours. END

The Air Industry

(*Continued from page* 15)

reversed, Congress will give the air arm more vigor than would be possible under the reduced expenditures allowed by the President's budget. More important, it has set out to give definite legislative recognition to the 70-group Air Force program.

To get the right slant, you must understand the two ways Congress can act. It passes annual appropriation bills for the Air Force and other services. These measures provide funds to keep the agencies operating during the fiscal year ahead. Amounts provided are usually recommended in the budget *though Congress can and usually does raise or lower the size of the appropriation.* In addition, Congress often adopts legislative programs of its own—sometimes acting on recommendations of the President, sometimes on its own. Once adopted, such legislation becomes an official authorization. More than this, it establishes a pattern for future appropriations. The actual money is still to be provided—but if it is not provided one year it can be appropriated the next. What it amounts to is a legislative commitment. Now the point is that the controversy over Air Force funds involves action on both these "fronts":

(1) An attempt to increase the actual appropriation for the new fiscal year.

(2) An attempt to pass legislation officially setting up a 70-group program as a two- or three-year goal, regardless of the amount appropriated this year. Chairman Vinson has indicated he may compromise on the amount for the new fiscal year, but that he intends to remain firm as far as legislation authorizing the 70-group program is concerned.

By placing legislative authority behind the program Congress can give it more substance. The aviation industry will be aided: it will know what is expected of it. A legitimate gripe of the industry has been that there is too much feast and famine about military business. To some extent this cannot be helped because defense policies naturally shift with developments abroad. But even when a rearmament program has been agreed upon, the Air Force has to parcel out orders in measly driblets. Under the present law neither the Air Force nor the Army has long range contract authority. The Navy is the exception in this respect and can project its procurement into the future.

Obviously, if Congress places its stamp of approval on the 70-group program, the Air Force will be able to plan ahead to a greater extent than is now possible. It will have authority to map a program over the period required to complete it. This will apply to research and development contracts as well as actual orders for planes and parts.

Take a look at the arithmetic of the situation:

Last year, the first installment for the program was whittled down to place it in line with only a 55-group force. Congress objected to this. It thought that National Defense was one place where it was dangerous to pinch pennies. So as a compromise it raised the amount sufficiently to make the four-year target a 66-group force. And it was the much lambasted, Republican-dominated 80th Congress at that!

President Truman's budget for the fiscal year of 1950 cuts the program to a 44-group level. In terms of dollars, he recommends spending nearly $3,000,000,000 less than is necessary to achieve the 70-group goal within four years.

The White House has issued reassuring statements, saying that appearances are apt to be deceiving as far as the budget action is concerned and that everything will come out all right in the end. These statements point out that the number of groups is not the sole yardstick—that the character, size, and other elements of the groups should be taken into consideration too. All of this is true, but a cut is still a cut.

Some quarters have insisted that the President is really trying to rap the Air Force on the knuckles. They say he harbors anti-air-power sentiments. But even a cursory examination of the record makes it clear that those contentions are not true. White House intimates explain it this way: They say that if Truman was a little arbitrary in dealing with the military budget it was because he felt that some of the Pentagon brass was getting too arrogant in its attitude. It went against his Missouri grain. But in the final analysis, it is claimed, he will not be

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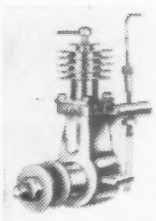

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averse to a dignified compromise.

Behind the scenes maneuvering on Capitol Hill indicates that Congressional leaders are on the trail of that kind of a compromise. They believe they have a way to get at least a part of the $3,000,000,000 needed for the Air Force's 70-group program. And they say they can do it without adding a dime to the spending side of the budget. The device is one familiar to family budget makers. All it involves is eliminating items that can be dispensed with, desirable as they may seem, in order to accommodate a "must" in a fixed income.

Congress thinks several items in the budget can be jettisoned. For one thing, the President included an allowance of $800,000,000 for starting universal military training. Rightly or wrongly, Congress is dead set against such a program, and a substantial saving can be made on this one item. The rest of the way will be more difficult. Over $2,000,000,000 more must be whacked off somewhere if the full installment for the 70-group program is to be provided without increasing the total budget figure. But it is a good bet that Congress will be able to scrimp enough on other expenditures to keep the Air Force program from sagging too much.

The Air Coordinating Committee, an official Government agency that helps to round out aviation policy, said some time ago that an annual production of 3,000 planes represents the minimum volume of military business necessary to keep the aviation industry alive. Yet the total procurement for the Navy and Air Force fixed in the budget for the fiscal year starting next July is only 2,333 planes of all types.

Obviously, a confusing picture is presented when plane procurement is given in terms of numbers.

Air frame weight is a better criterion. A survey conducted for the Air Coordinating Committee is understood to have disclosed that an annual procurement amounting to 80,000,000 pounds in air frame weight is required to put the industry in a proper "expansible" state for a military emergency. The air frame weight represented by the budget only comes to 34,000,000 pounds, lumping the Navy in with the Air Force.

What about a military assistance program to help western Europe rearm? This is definitely in the cards. It will be similar to lend lease, with the aim of putting substance behind the North Atlantic security pact. It will include some war planes although most experts say that it will concentrate on mobile ground equipment. Aviation aid to the countries involved will be obtained from Air Force reserve equipment. Then the Air Force will collect the price of the equipment from the Treasury or whatever agency runs the program. It will use the money thus obtained to buy new planes of the latest type. Thus, indirectly, the program will speed up the modernization of our own air arm.

For understandable reasons our top military minds have not looked with favor on any kind of assistance to foreign governments that involved giving away large bombers. They have not objected so much to smaller twin-engined types, but don't want us to release anything capable of crossing the ocean against us if it fell into the wrong hands. Whether this basic policy will be revised remains to be seen. If it remains unchanged, aid to Europe will center around fighter types such as F-80s. However, it is known that the British have asked for 100 B-29s. This would probably be "extra-curricular" and might not be included in the general military assistance program.

No matter how the score is added, it means that with the world in its present troubled state and no easing of the tension apparent, the aviation industry can expect bigger orders. As a result of a more common-sense approach represented by legislation in the making, this load will be better distributed and will not be increased and lessened as alternately as it is under present procurement policies. Finally, if the industry gets to the point where it cannot obtain all of the aluminum or other scarce items it needs, it can count on Government aid in getting allocations. Even if Congress does not clothe the President with stand-by rationing powers as he has requested, it will extend the voluntary allocation plan. However, Congress doubts that assistance of this sort will be needed to implement the production of war planes. END

The Mail Box

(Continued from page 6)

RED OBJECT

. . . What's the red object in the air in-

take of the McDonnell Banshee on FLYING's February cover?

WILBUR G. HARNED
Guthrie, Okla.

• It's an air intake valve—a metal disk operated by an electric actuator controlled by a cockpit switch. Major purpose: to cut down the drag and to save fuel while the twin-jet fighter is on single engine operation. It also keeps debris from entering the air intake.—ED.

AIR WAR IN PALESTINE

. . . Out of fairness to the British, who are your natural allies, perhaps you will allow me to air the British view regarding the ["Air War in Palestine," October, 1948, FLYING].

We maintain the Transjordan Air Force to defend our oil interests [as the] fields are only two hours flying time away from [a potential] aggressor nation . . .

We had military forces based in Egypt for a long period, and have only just

withdrawn them. When we are in occupation of a friendly country, we always show its nationals our techniques . . .

We maintain a mission with the Arabs because they are our friends. Because the Jews choose to quarrel with them is no reason for our ceasing to be friends. We are unlikely to forget that the Arabs helped us decisively in the 1914-1918 war. They have constituted the major portion of the population of Palestine for [almost] 1,000 years . . .

. . . I maintain that any anti-British sentiments expressed by word or in an article constitute a danger not only to the British but to the Americans.

I sincerely hope you will consider publication of this letter. As a flyer I know that aviators the world over are fair-minded and that they do much thinking between flights. This little expose of the British point of view may . . . make some people in the U. S. think twice before blaming the British for the Jewish quarrel.

CHARLES BOVILL

London, England

I was interested in "Air War in Palestine" as I have just returned to the United Kingdom after two years in the Middle East . . .

It may interest your readers to know that when the U. S. Air Force handed over the vast John Payne Field (base at Helipolis near Cairo) over 100 Curtiss *Commandos* were included in the transaction. The Egyptians paid approximately [one million Egyptian pounds] for the airport, planes and ground equipment . . .

[A few] months ago several of these C-46s appeared over Cairo with Egyptian Air Force markings . . . I discovered they had succeeded in making at least 20 of the planes fully serviceable, with the help of employees of a U. S. international airline. These pilots and aircrews, based in Cairo, made no secret of their pro-Arab feelings by cabling President Truman . . . that the U. S. was making a grave political blunder by recognizing Israel.

Furthermore, the Egyptians also privately purchased a number of British Short *Stirling* bombers from a Belgian non-scheduled operator . . . Needless to say, the Belgian government turned a convenient blind eye to the whole affair.

. . . It all goes to show that there are always ways and means of supplying combatants with arms and planes, in spite of repeated assurances to the contrary of leading statesmen and government officials of the UN powers . . .

DENNIS M. POWELL

Prestwick, Scotland.

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AERONCA Super Chief: #4142E. 85 HP. Built 1947. Only 78 hours total. Mufflers. New condition. Licensed June 1948. Asking $1600. No trades. Apply, Powers & George, Aircraft Brokers, 475 5th Ave., New York, N. Y.

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BONANZA: Night and day instruments. VHF transmitter receiver, flares, seat covers, complied with all bulletins. Excellent condition, flown only by commercial pilot. $7,000. C. W. Lamson, Box 378, Woodsboro, Tex.

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BONANZA: #662B. Heavy skinned model A35. New March 1948. Total time 206 hours. Beautiful new condition. Asking $8700. For details consult Powers & George, Aircraft Brokers, 475 5th Ave., New York, N. Y.

BEECH D18-S: #81213. Twin engines. Built 1946. Beautiful executive interior. 495 hours total. De-icing equipment, etc. All bulletins complied with. Top condition. Asking $45,000. Offers considered. Apply, Powers & George, Aircraft Brokers, 475 5th Ave., New York, N. Y.

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BELLANCA Cruisair: #87877. Only 145 total hours. Relicensed June 1948. Small tail fins. Outside baggage door. Latest soundproofing and mufflers. Aeromatic propeller, radio, manifold pressure and extra instruments. Asking $3400. Inquire, Powers & George, Aircraft Brokers, 475 5th Ave., New York, N. Y.

WANT to buy late model Bellanca for personal use. Give full particulars. Walter Meyer, Madeira, Ohio.

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GOOSE Amphibians: 5 available. #60274 has 1310 total hours. New zero time engines. November 1948 zinc chromated, recovered, repainted, re-upholstered, relicensed, new ADF, and automatic pilot. Outstanding airplane. Asking $42,000. Offers considered. Apply, Powers & George, Aircraft Brokers, 475 5th Ave., New York, N. Y.

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NORSEMAN: #50786. Nine place. Built September 1945. 267 hours total. Gyros, loop, etc. Relicensed February. Finest condition. Asking $6000. Want offer. No trades. Inquire, Powers & George, Aircraft Brokers, 475 5th Ave., New York, N. Y.

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1947 SEABEE for sale or trade on Cessna 140 or Swift 125. Edwin Vogel, Lohrville, Ia. Phone 36-119 Farnhamville, Ia.

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NORTH American F-51. State condition, hours, price, etc. Box 621 % FLYING.

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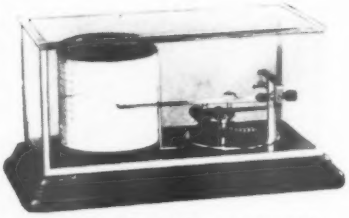

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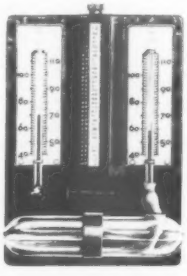

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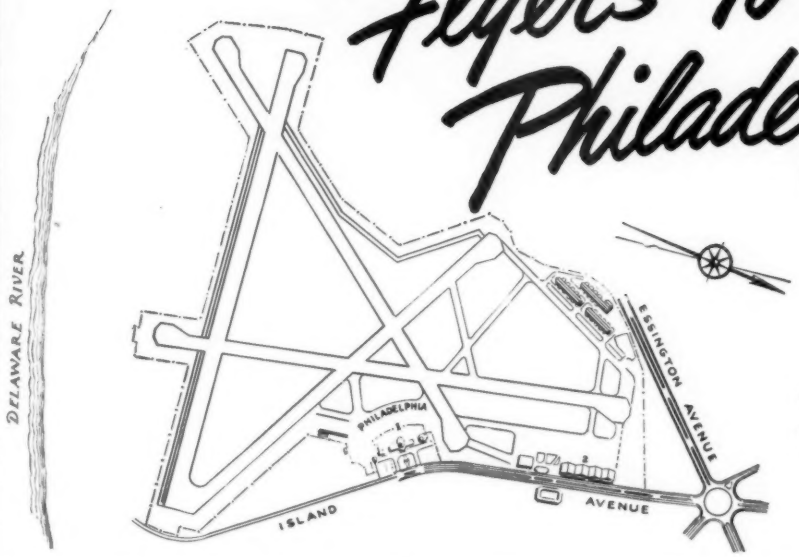

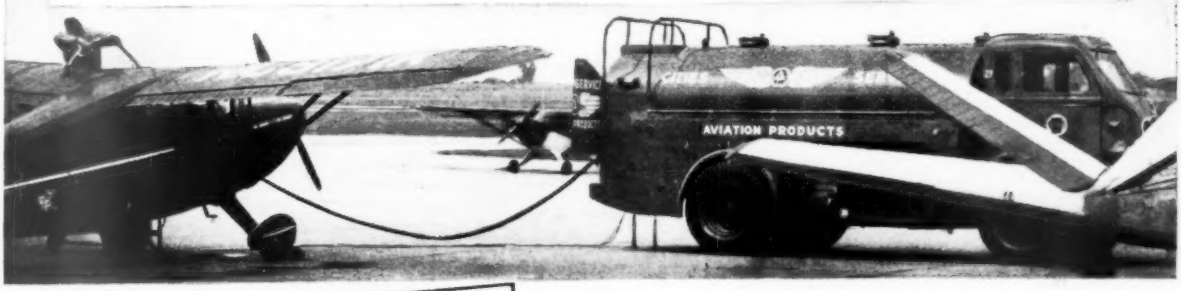

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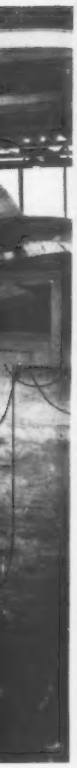

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